THE DISEASES OF CHILDREN

A CLINICAL HANDBOOK

ELDER & FOWLER

To the Library of the Royal College
of Physicians
from the Author

June 19th 1895.

Fl 4: 1. 33

R39635

THE DISEASES OF CHILDREN.

GRIFFIN'S MEDICAL POCKET-BOOKS.

Elegantly bound in Leather, with Gilt Edges and Rounded Corners.

◆◆◆

THE DISEASES OF CHILDREN. A Clinical Handbook. By GEO. ELDER, M.D., F.R.C.P. (Ed.), and J. S. FOWLER, M.B., F.R.C.P. (Ed.), Clinical Tutors, Royal Infirmary, Edinburgh, Physicians for Out-Patients, Leith Hospital.

A MEDICAL HANDBOOK. BY R. S. AITCHISON, M.B., F.R.S.E. THIRD EDITION. With Illustrations. Pocket size, Leather, 8s. 6d.

A SURGICAL HANDBOOK. For Practitioners, Students, House-Surgeons, and Dressers. By F. M. CAIRD, F.R.C.S. (Ed.), and C. W. CATHCART, F.R.C.E. (Eng. and Ed.), Assistant Surgeons, Royal Infirmary, Edinburgh. NINTH EDITION. 8s. 6d.

"ADMIRABLY ARRANGED. The best practical little work we have seen."—*Edinburgh Medical Journal.*

THE SURGEON'S POCKET-BOOK. By Surgeon-Major PORTER and Brigade-Surgeon C. H. Y. GODWIN, late Professor of Military Surgery in the Army Medical School. With Illustrations. FOURTH EDITION. 8s. 6d.

"An INVALUABLE GUIDE."—*The Lancet.*

HYGIENE (A Handbook of). By Surgeon-Major A. M. DAVIES, D.P.H. (Camb.), late Assistant-Professor of Hygiene, Army Medical School. With Illustrations. Pocket size, Leather, 12s. 6d.

"This ADMIRABLE HANDBOOK."—*Edinburgh Medical Journal.*

OUTLINES OF BACTERIOLOGY. A Practical Handbook for Students. By Dr. L. H. THOINOT, Professeur agrégé à la Faculté. Médecin des Hôpitaux; and E. J. MASSELIN, Médecin Vétérinaire. Translated and adapted for English Use, with Additions, by WM. ST. CLAIR SYMMERS, M.B. (Aberd.). [*At Press.*

THE PHYSIOLOGIST'S NOTE-BOOK. BY ALEX HILL, M.A., M.D., Master of Downing College and Vice-Chancellor of the University of Cambridge. Large 8vo. With numerous Plates. Cloth, 12s. 6d.

"An ADMIRABLE COMPENDIUM of our present information."—*Lancet.*

Works by PROF. STIRLING, M.D., D.Sc.

PRACTICAL PHYSIOLOGY (Outlines of). Part I.—Chemical Physiology. Part II.—Experimental Physiology. THIRD EDITION. Extra Crown 8vo. Numerous Illustrations. Cloth. 12s. 6d.

PRACTICAL HISTOLOGY (Outlines of). SECOND EDITION. Extra Crown 8vo. With 368 Illustrations. Cloth, 12s. 6d.

LONDON: CHARLES GRIFFIN & CO., LTD., EXETER ST., STRAND.

THE

DISEASES OF CHILDREN:

A Clinical Handbook.

BY

GEORGE ELDER, M.D., F.R.C.P.(Ed.),

AND

J. S. FOWLER, M.B., F.R.C.P.(Ed.),

CLINICAL TUTORS, ROYAL INFIRMARY, EDINBURGH; PHYSICIANS FOR OUT-PATIENTS, LEITH HOSPITAL.

ROYAL COLLEGE OF PHYSICIANS, EDINB.
LIBRARY.

LONDON:
CHARLES GRIFFIN & COMPANY, LIMITED;
12 EXETER STREET.
1899.

[*All Rights Reserved.*]

PREFACE.

THIS Manual is designed for the use of students attending courses of instruction on the Diseases of Children. We have tried, as far as possible, to deal with the subject from the clinical aspect—hence the large amount of space devoted to Diagnosis—and have endeavoured to avoid discussing pathological questions further than is necessary for a proper understanding of the matter in hand.

We have given prominence to those diseases which are peculiar to children, or which differ considerably from the same affections in adult life; while others, presenting no special features in virtue of their occurrence at an early age, we have left almost unnoticed.

We have thought it advisable in a book of this character to avoid quoting authorities; but we should like here to express our indebtedness to the well-known text-books of West, Henoch, Eustace Smith, Starr, Rotch, and Holt, as well as to Keating's *Cyclopædia*, Gerhardt's *Handbuch*, the recent treatise of Grancher, Comby, and Marfan, and many other works on special departments of the subject.

Our very sincere thanks are due to Dr. C. B. Ker, Medical Superintendent of the Edinburgh Fever Hospital, who has been kind enough to revise the chapter on Infectious Diseases.

G. E.
J. S. F.

EDINBURGH, *April*, 1899.

CONTENTS.

SECTION I.

CHAPTER I.—ANATOMY.

PAGE

Vertebral Column—Head and Face—Neck—Thorax—Abdomen—Brain and Membranes, ... 1

CHAPTER II.—PHYSIOLOGY.

Growth of the Child—Height—Weight—Head—Thorax—**Circulatory System**—Circulation in the Fœtus—Heart—Pulse—Lymphatic System—**The Blood**—**Respiratory System**—**Alimentary System**—Dentition—Sucking—Salivary Secretion—Gastric Digestion—Intestinal Digestion—Pancreatic Juice—Intestinal Juice—Bacteria of the Intestinal Tract—Fæces—**Urinary System**—Act of Micturition—Amount of Urine—Specific Gravity—Characters of Urine—**Integumentary System**—**Temperature**—**Nervous System**—Brain—Special Senses—Emotions—Sleep—Development of Language, . . 7

CHAPTER III.—FEEDING IN INFANCY AND CHILDHOOD.

Infant Feeding—**Elements of the Food**—**Natural Feeding**—Human Milk—Maternal Nursing—Weaning—Premature Weaning—Contra-indications to Maternal Nursing—Wet Nursing—**Artificial Feeding**—Composition of Cow's Milk—Cow's Milk as a Diet for Infancy—Rules for Artificial Feeding—Sterilised and Pasteurised Milk—Peptonised Milk—Humanised Milk—Condensed Milk—Whey—White Wine Whey—Infants' Foods—Raw Meat Juice—Egg-albumin and Water—**Feeding in later Infancy and Childhood**, . . 23

CHAPTER IV.—GENERAL THERAPEUTICS.

PAGE

Diet—Feeding—Dress—Bathing—Massage—Electricity—Attention to the Bowels—Rectal Injections—Poultices—Counter-irritants—Depletion—Cleansing of the Mouth and Nose—Bronchitis-tents — **Medication by Drugs** — Dosage — Antipyretics — Stimulants—Hypnotics—External Applications in Skin Diseases—Posological Table, ... 40

SECTION II.

CHAPTER V.—DIAGNOSIS.

METHOD OF EXAMINATION—ANAMNESIS.

Method of Examination—Case-taking Card—Anamnesis—Family History—Previous History—History of Present Illness—Hygiene and Surroundings, ... 51

CHAPTER VI.—DIAGNOSIS (*Continued*).

GENERAL EXAMINATION—TEMPERATURE—EXAMINATION OF SKIN.

General Examination—I. Position—II. Facies—III. Obvious Morbid Appearances and Actions—Crying—Sucking—Sleep—Gait—Other Characteristic Appearances—**IV. General State of Nutrition—Observation of the Temperature—Examination of the Skin and Subcutaneous Tissues—I. Colour**—Pallor—Excessive Redness—Cyanosis—Icterus—Discolouration of the Skin—**II. Moisture of the Skin—III. Œdema—IV. Subcutaneous Emphysema—V. Cicatrices and Scars—VI. Cutaneous Eruptions**—1. Erythematous or Macular Eruptions—2. Papular Eruptions—3. Hæmorrhagic Eruptions—4. Scaly Eruptions—5. Vesicular Eruptions—6. Pustular and Crusted Eruptions—7. Other Cutaneous Lesions, 60

CHAPTER VII.—DIAGNOSIS (*Continued*).

ALIMENTARY AND HÆMOPOIETIC SYSTEMS.

Examination of the Alimentary System: I. Mouth and Adjacent Parts—Lips—Mouth—Gums—Teeth—Tongue—

PAGE

Palate — Tonsils, Fauces and Pharynx — Œsophagus — **II. Digestive Functions**—Thirst—Appetite—Perverted Appetite—Vomiting—Vomited Matters—Defæcation—Constipation—Diarrhœa—**III. Physical Examination of the Abdomen**—General: Inspection—Palpation—Percussion—Auscultation—Examination of Individual Organs: Stomach—Liver—Rectum and Anus—**Examination of the Hæmopoietic System**: Spleen—Glands—Salivary Glands—Thyroid—Thymus—Blood, 85

CHAPTER VIII.—DIAGNOSIS (*continued*).

CIRCULATORY, RESPIRATORY, AND URINARY SYSTEMS.

Examination of the Circulatory System: Heart—The Pulse—**Examination of the Respiratory System**: Epistaxis—Nasal Discharge—Dyspnœa—Voice and Cry—Respiratory Stridor—Cough—Pain in the Chest—Expectoration—Hæmoptysis—Inspection of the Chest—Palpation—Auscultation—Percussion—Exploratory Puncture—**Examination of the Urinary System**: Temporary Anuria—Increased Frequency of Micturition—Difficulty in Micturition—Incontinence of Urine—**Physical Examination of the Genito-Urinary System**—**I. Genito-Urinary Organs**: Kidneys—Bladder—**II. Urine**: Quantity—Albuminuria—Hæmaturia—Hæmoglobinuria—Indicanuria—Diaceturia—Glycosuria, ... 105

CHAPTER IX.—DIAGNOSIS (*continued*).

NERVOUS AND LOCOMOTORY SYSTEMS.

Examination of the Nervous System: **I. Cranium and Spine**—Enlargement of the Cranium—Small Cranium—Asymmetry of the Skull—Movements of the Fontanelle—Spinal Column—Lumbar Puncture—**II. Mental Condition**: **Speech**—**III. Sensory Functions**: Eye—Ear—**IV. Motor Functions**: Organic Reflexes—Deep Reflexes—Involuntary Movements—**V. Trophic Functions**—**Examination of the Locomotory System**: Joints—Epiphyses—Shafts—Muscles, . . . 122

SECTION III.

CHAPTER X.—DISEASES OF THE NEWLY-BORN CHILD.

PAGE

I. Congenital Feebleness—II. Asphyxia Neonatorum—III. Congenital Atelectasis—IV. Cephalhæmatoma—V. Hæmatoma of the Sterno-Mastoid—VI. Mastitis—VII. Icterus Neonatorum—VIII. Sclerema Neonatorum—IX. Œdema Neonatorum—X. Ophthalmia Neonatorum—XI. Acute Pyogenic Diseases—XII. Tetanus or Trismus Neonatorum—XIII. Hæmorrhagic Diathesis of Infancy—XIV. Pemphigus Neonatorum—XV. Inanition Fever—XVI. Umbilical Hernia, Tumours, &c.—XVII. Birth Paralyses—XVIII. Acute Fatty Degeneration—XIX. Epidemic Hæmoglobinuria, ... 136

CHAPTER XI.—GENERAL CONSTITUTIONAL DISEASES.

Infantile Atrophy—Congenital Syphilis—Rickets—Scorbutus—Rheumatism—Rheumatoid Arthritis—Chronic Rheumatic Arthritis—Sporadic Cretinism—Achondroplasia—Mongolian Idiocy—Fragilitas Ossium—Purpura, ... 157

CHAPTER XII.—DISEASES OF THE ALIMENTARY SYSTEM.

Stomatitis—Acute and Chronic Gastro-intestinal Catarrh—Dilatation of the Stomach—Congenital Hypertrophy of the Pylorus—Intestinal Obstruction—Constipation—Idiopathic Dilatation of the Colon—Prolapse of the Rectum—Rectal Polypus—Malformations of the Intestines—Abdominal Tuberculosis—Affections of the Peritoneum—Worms—Catarrhal Jaundice—Cirrhosis of the Liver—Fatty Liver—Congenital Obliteration of the Bile Ducts—Gall-stones, ... 191

CHAPTER XIII.—DISEASES OF THE HÆMOPOIETIC SYSTEM.

Diseases of the Blood—Simple Anæmia—Chlorosis—Pernicious Anæmia—Leucocythæmia—Other Forms of Anæmia—**Diseases of the Spleen**—**Diseases of the Thymus**, . . 235

CHAPTER XIV.—DISEASES OF THE CIRCULATORY SYSTEM.

PAGE

Acute Endocarditis and Pericarditis—Malignant Endocarditis—Chronic Valvular Disease—Adherent Pericardium—Myocarditis—Functional Affections of the Heart—Affections of the Blood-vessels—Congenital Affections of the Heart, . . . 245

CHAPTER XV.—DISEASES OF THE RESPIRATORY SYSTEM.

Rhinitis — Pharnygitis — Adenoids — Retropharyngeal Abscess — Acute Laryngitis — Bronchitis — Pneumonia (Croupous and Catarrhal)—Interstitial Pneumonia—Emphysema—Atelectasis — Enlarged Bronchial Glands — Pulmonary Tuberculosis — Asthma—Inflammations of the Pleura, ... 259

CHAPTER XVI.—DISEASES OF THE URINARY SYSTEM.

Bright's Disease — Urinary Lithiasis — Hydronephrosis—Tumours of the Kidney—Cysts of the Kidney—Vulvo-vaginitis, . . 292

CHAPTER XVII.—DISEASES OF THE NERVOUS SYSTEM: FUNCTIONAL.

Infantile Convulsions—Epilepsy—Laryngismus Stridulus—Congenital Laryngeal Stridor—Tetany—Chorea—Spasmus Nutans—Habit Spasm—Spasmodic Wry-Neck and other Spasmodic Affections of Peripheral Nerves—Hysteria—Pavor Nocturnus, or Night Terrors—Insomnia—Enuresis—Migraine, Headaches, and Neuralgia, ... 300

CHAPTER XVIII.—DISEASES OF THE NERVOUS SYSTEM (*continued*): ORGANIC.

Inflammation of the Meninges of the Brain—Infantile Cerebral Paralysis — Hereditary (Spinal) Spastic Paralysis—Vascular Disturbances in the Brain—Chronic Hydrocephalus—Menin-

PAGE
gocele and Encephalocele—Spina Bifida—Tumours of the Brain—Aphasia and other Speech Defects—Acute Anterior Poliomyelitis—Progressive Muscular Dystrophics—Birth Paralyses of Peripheral Origin, ... 319

CHAPTER XIX.—ACUTE INFECTIOUS DISEASES.

Diphtheria—Typhoid or Enteric Fever—Scarlet Fever—Measles—German Measles—Chicken-pox—Whooping-cough—Mumps—Epidemic Cerebro-spinal Meningitis—Glandular Fever, . 351

INDEX, ... 383

LIST OF ILLUSTRATIONS.

FIG. PAGE
1. Tetany, ... *To face* 64
2. Post-scarlatinal Nephritis, ... ,, 64
3. Two Brothers showing the Adenoid Facies, . ,, 64
4. Rickety Head, ... ,, 64
5. Slight Hydrocephalus, ... ,, 64
6. Cured Hydrocephalus, ... ,, 64
7. Impetigo Contagiosa, ... ,, 83
8. Total Alopecia of Six Years' Duration, . . ,, 84
9. Tubercular Adenitis simulating Hodgkin's Disease, ,, 104
10. Pigeon Breast, ... ,, 114
11. ,, showing Harrison's Sulcus, . ,, 114
12. Markedly Emphysematous Chest, following Whooping-cough in Infancy, ... ,, 115
13. Deformity of Chest, following Spinal Disease, . ,, 115
14, 15. Normal Fontanelle Tracings, showing Respiratory Undulations and Anacrotic Character of Individual Pulse Wave, ... 124
16, 17, 18. Normal Fontanelle Tracings during Sleep, Awake (Lying Down), and Awake (Sitting Up), . . 126
19. Fontanelle Tracing taken from an Infant Six Weeks' Old, ... 127
20. Fontanelle Tracing from a Case of Tubercular Meningitis, with Cheyne-Stokes' Respiration, . . . 128
21. Congenital Facial Hemiatrophy, . . . *To face* 133
22. True Osteo-Arthritis, ... ,, 133
23. Mongolian Idiot, ... ,, 188

DISEASES OF CHILDREN.

SECTION I.

CHAPTER I.

ANATOMY.

Contents.—Vertebral Column—Head and Face—Neck—Thorax—Abdomen—Brain and Membranes.

THE average weight of the newly-born child is about 7½ lbs. The trunk, as a whole, is somewhat egg-shaped, the lower being the larger end. At birth the circumference of the chest is slightly less than that of the head; by the middle of the second year the two are about equal; and if, in the third year, the head be larger than the chest some pathological condition certainly exists. The skin at birth is red and hyperæmic, the sebaceous glands are well developed and active, and the cutaneous surface is covered with the vernix caseosa.

At this period, and for many years later, the skeleton is but imperfectly developed and ossification is incomplete. The periosteum of the long bones is thick, vascular, and firmly attached to the epiphysial cartilages. In early childhood the tendons and ligaments are much stronger than the contiguous bone, and, in consequence, a fracture results from violence more readily than does a sprain.

At birth the **vertebral column** presents but two curves: the long dorsal curve, whose concavity looks forward and which extends from the atlas to the upper part of the sacrum, and the shorter, sacro-coccygeal curve, whose concavity points in the same direction. The spine of the infant is characterised by extreme flexibility; its dorsal curve can be easily obliterated, and in the dissected state the atlas vertebra can be readily bent back to touch the tip of the sacrum. Some, therefore, hold that, in the strict sense of the term, it is erroneous to speak of an infant's spine as forming curves. The various divisions of the column differ from those of the adult in their ratio to one another, the lumbar and cervical regions being of equal length, while in later life their relation is as three to two. With the assumption of the erect attitude other curves develop; and associated with the straightening of the lower limbs, as the art of walking is acquired, we have the appearance of the lumbar convexity. In all probability muscular action has much share in the production of the lumbar and cervical curves. Even in the adult the cervical curve is never consolidated, but can always be obliterated by bending the head; the lumbar curve, on the contrary, ultimately becomes consolidated, and persists in spite of efforts to straighten it. The bodies and arches of the vertebræ are ossified at puberty, the epiphyses follow at a later date.

So small is the distance from the manubrium sterni to the vertebral column, that pressure on important structures lying between may be easily caused by an hypertrophied thymus or enlarged glands. The sternum is ill developed, especially at its lower part; the base of the thorax is relatively wider and the height is relatively less than in the adult. The ribs and the upper opening of the thorax lie in an almost horizontal position, and the costal angle is in consequence very obtuse.

The pelvic obliquity is great and the capacity small; the sacrum is almost straight, and the pelvic bones—at all events in the newly-born child—move freely on each other.

Even in the newly-born child the arch of the instep is present, although, especially in fat infants, the foot may appear to be almost flat. As the child begins to walk there is a temporary destruction of the arch, but by the third year it is rebuilt.

Head and Face.—The occipito-frontal circumference of the head is about 13¾ inches. The base of the skull is, as a whole, flat and cartilaginous, while the vault is membranous. In addition to the sutures, fontanelles are present; of these the anterior is the largest and remains longest open, not becoming closed till the latter half of the second year. The posterior fontanelle should be imperceptible by the sixth or seventh week. The pericranium is firmly attached to the sutures, but very loosely adherent to the surfaces of the skull bones; in this respect it contrasts markedly with the dura mater. The skull is, as a whole, yielding and resilient, the hollows and air-sinuses are rudimentary at birth, and remain small till the ninth year, when they begin to increase in size, and at puberty grow very rapidly. The internal ear, tympanic cavity, and ossicles have much the same structure as in later life. The external auditory meatus, Eustachian tube, and mastoid, however, require considerable modification before they attain—about the age of puberty—the adult type. The meatus is almost straight and passes inward and downward; it consists mainly of an outer cartilaginous portion, the inner part being fibrous or osseo-fibrous, and forming relatively less of the passage than does the osseous part of the completely developed canal. The Eustachian tube has in infancy a horizontal position, but as the child grows it comes to lie more obliquely. The membrana tympani is said to be more horizontally placed than in the adult. It would appear, however, that this is more apparent than real, and that, in consequence of the great obliquity of the meatus, the angle between its floor and the membrane is more acute than later. As a result, the latter appears to lie almost parallel with the meatus, and therefore conveys the impression of being horizontal. The mastoid process is rudimentary in the newly-born, being represented by a small tubercle, which, partly on account of muscular action, grows in a downward direction. By the third year it has gained its adult type, but is not of any considerable size before puberty. At birth an antrum is present; it is absolutely larger than in the adult, communicates with the tympanic cavity by a large opening, lies at a relatively high level, and is close to the surface of the bone—facts which must be borne in mind when operating on the mastoid of a young infant. Its size remains unchanged until about the thirteenth year, before which period no air cells are present. Nevertheless, by a gradual deposition of bone below and outside the mastoid antrum, it has by this period been somewhat removed from the outer surface of the bone, and, in consequence of this, the tendency of inflammation to spread inwards is greater than in infancy. At and after puberty the antrum gradually grows smaller, and many air cells develop, first at its upper and posterior part, arranging themselves concentrically around it. This symmetrical disposition, however, is soon lost, owing to the fusion of adjacent cells. In morbid conditions pus will now tend to travel outwards, as well as inwards toward the lateral sinus. The petro-squamous suture remains patent until the end of the first year, and affords a channel by which inflammation readily extends to the cranial cavity.

In comparison with the vault of the skull, the face is very small, and, proportionately to its length, it is much broader than at maturity. Its small size is due to deficient development of the jaws, teeth, and maxillary sinuses. As age advances the size of the face increases by downward growth. The angle of the jaw is obtuse until adult life is reached; by that time it has become a right angle, only to return to its infantile shape as age still further advances.

The cheeks contain a considerable amount of fat. This is divisible into two parts: the one continuous with the subcutaneous adipose tissue; the other in the form of an encapsuled mass of lobules which may easily be shelled out. This structure is known as the sucking-cushion or pad, and lies on the outer aspect of the buccinator muscle; its function is to distribute atmospheric pressure, and to prevent in-drawing of the cheek in the act of sucking. These pads exist at all periods of life, but are best seen in infancy; even in extreme emaciation fat persists here after it has disappeared elsewhere.

The gums of the newly-born infant do not meet; the cavity of the mouth is hyperæmic, and the mucous membrane dry. Along the median raphé of the hard palate is often to be seen a series of yellowish-white round or oval nodules, of the size of a pin's head or a little larger. These arise from the inclusion of small masses of epithelium in spaces left between the bones at the time of union of the halves of the palate. They are quite without clinical significance. The hard palate is on a level with the basi-occipital. The pharynx is widest opposite to the hyoid bone, narrowest at the cricoid cartilage, and this part is within easy reach of the exploring finger. The nasal cavity is long and shallow, the lower or respiratory portion being extremely narrow. The naso-pharynx is more of a canal and less of a vestibule than in the adult; it is relatively long, the distance from the posterior margin of the hard palate to the pharyngeal wall being little less than in later life. It is extremely narrow; its dimensions are such as just to admit the point of a medium-sized catheter. The pharyngeal tonsil lies between the orifices of the Eustachian tubes, in the posterior wall and vault of the pharynx. The mucous membrane is thrown into a series of vertical folds in which the lymphoid tissue of the tonsil is placed. In the fœtus and young subject a median fissure, known as the pharyngeal bursa, extends from below the level of the tonsil to the base of the sphenoid. The tonsil increases in size after birth, and at the age of a year is nearly an inch in diameter; it atrophies after puberty. The faucial and pharyngeal tonsils, together with the lymphoid tissue about the root of the tongue and Eustachian tubes, form a ring of absorbent structures round the respiratory and buccal passages.

The septum of the nose is always straight up to the seventh year; thereafter deviations are common. The epiglottis is more folded upon itself than in the adult.

Neck.—The neck is encroached upon both by the high position of the sternum—the top of the manubrium being at the level of the first dorsal vertebra—and also by the flexion of the head. Its shortness is, therefore, to a great extent apparent. The larynx, as a whole, is more highly placed than in the adult by the extent of one and a half vertebræ, so that the cricoid at birth is on a level with the fifth cervical; by the fifth or sixth year it has descended to the intervertebral disc below. This downward growth of the larynx is due to the downward growth of the face. The calibre of the trachea may roughly be estimated at about the diameter of the index finger of the child. Owing to its small size, the thyroid cartilage forms a much less prominent and certain landmark than does the cricoid, which can always be felt even in the fattest neck. The trachea bifurcates at the level of the third dorsal vertebra—somewhat higher than the adult. The deep fascia of the neck is ill-defined and but slightly resistent, consequently abscesses are less limited in their extent.

The lymphatic glands of the neck may be roughly classified into three groups—(1) Submaxillary, which drain the sublingual and submaxillary glands and the floor of the mouth; (2) deep carotid, draining the cranium, tongue, larynx, and pharynx; (3) superficial, draining the external ear, mastoid, and occipital glands, and the skin of the neck.

Thorax.—The shoulders are small, and the thorax is more rounded than in the adult. At birth the relation of the internal antero-posterior diameter is to the transverse as 1 : 2; at thirteen it is as 1 : 2½; in the adult as 1 : 3 or 3½. As has been stated, the ribs are almost horizontal; they readily yield to pressure, especially at the point where the bone joins the cartilage; the intercostal muscles are but slightly developed. Often, as in the adult, there is some asymmetry of the lateral halves of the chest.

The chief anatomical peculiarity of the **lungs** is that their anterior margins do not quite touch each other. On account of the high position of the diaphragm, which is a well-developed muscle and plays an important part in the respiration of the infant, and also owing to the presence of the thymus, there is little room for expansion of the lungs. The central tendon of the diaphragm is one vertebra higher than in the adult, lying opposite to the intervertebral disc between the bodies of the eighth and ninth dorsal; the highest part of the dome of the diaphragm is approximately at the level of the fourth rib. The lungs are relatively small and the lower air passages wide; in the healthy child the inferior margins and the apices occupy the same position as in the adult. The growth of the lungs is most rapid at puberty.

The **thymus** reaches its greatest size about the second year; it lies in the superior and anterior mediastina, and extends as low as the fourth rib, and as high as the lowest part of the thyroid gland. It consists of two unequal lateral lobes, and at birth is about 2 inches long, by 1½ inches wide, by ⅓ inch thick. The limits of this structure, however, vary much both with age and in different individuals.

The **heart** occupies a relatively large part of the thorax. In the fœtus the auricles are larger than the ventricles, and the right is larger than the left auricle. Just before birth this state of matters is reversed, and the left ventricle becomes the largest part. In the interauricular septum of the new-born child we find the foramen ovale, and in the right auricle the large Eustachian valve directing blood through this from the inferior vena cava. The fœtal pulmonary artery divides into a right and a left branch, and from the latter the ductus arteriosus springs to join the aorta. There is some divergence of opinion as to the exact site of the cardiac apex in the child. Its position is usually somewhat higher, and, as the heart is a relatively large organ, more lateral than at a subsequent period. It often lies behind the fifth rib and allows the beat to be felt in the fourth interspace. The younger the child, the further from the median line is the apex, but an impulse whose point of maximum intensity is more than one inch outside the nipple is certainly pathological. The heart is less covered in by lung than when maturity is reached, but the pleural sacs extend as far forward as in the adult. The arteries generally, and especially the pulmonary artery, are relatively wide in infancy. The growth of the heart is greatest in the first year and then again at puberty.

Abdomen.—On account of the large size of the liver and the small capacity of the pelvis, the abdomen is prominent. From birth to the second year the umbilicus is the central point of the body. After this period the legs grow rapidly and consequently it is situated nearer to the head.

The **stomach** lies almost vertically, the fundus is non-existent at birth; the cardia is the highest point, being at the level of the eleventh dorsal vertebra. The pylorus is but slightly developed, the gastric musculature as a whole is weak, and owing to insufficiency of the cardiac sphincter regurgitation of food easily takes place. The organ rapidly increases in energy and in size; at birth it has a cubic capacity of 1 ounce, by the sixth month it can contain 6 ounces of fluid.

The **liver** is relatively larger at the sixth month than at any other period. It extends well into the abdomen, reaching about an inch below the costal margin in the right nipple line, and almost 2 inches in the parasternal line, while in the mesial plane its lower border is midway between the ensiform cartilage and the navel. The left lobe extends beyond the left sternal margin by about an inch, and, owing to its large size, covers a greater area of the anterior stomach wall than is the case in the adult. The upper border of the liver has almost the same relations as at a later period, and the apparently deep position of the organ would seem to be in some degree due to the comparatively horizontal inclination of the costal margin.

The **spleen** is a very variable organ in the child; normally its relations are the same as in the man. The **kidneys** are large, and at birth still possess their fœtal lobulation. Since in the child the lumbar spine is a comparatively short structure, the position of the organs is somewhat low.

The **intestines** as a whole, but particularly the cæcum, ascending colon, and sigmoid flexure, are characterised by great mobility. At birth the small intestine is about 9½ feet in length. Its capacity is relatively twice that of the adult bowel. Its walls are marked by slight development of the muscular elements and by a very vascular mucosa. There is some uncertainty as to the exact state of the intestinal glands at or shortly after birth, but it would at least appear certain that in the earliest months of life there is an enormous and very rapid increase in the lymphoid structures of the bowel. The cæcum and sigmoid flexure form the larger part of the colon, and during the first four months do not increase in size. The upper portion of the rectum is abdominal, and, as a whole, this division of the alimentary canal is vertical—a disposition favouring prolapse. The **bladder** is egg-shaped, the upper narrow end being compressed by the hypogastric arteries; the neck is at the level of the pubic symphysis. The organ is very laxly attached to the pelvic walls, and sinks gradually into the cavity as age advances. The prostate gland is small, the membranous urethra correspondingly long: when the resistance of the meatus has been overcome, the passage is so distensile as to admit of the introduction of a medium-sized bougie; the walls are thin and delicate. At the eighth month of intra-uterine life, the testicle lies at the internal abdominal ring, but, preceded by the vaginal process of peritoneum, has by full term descended into the scrotum. The inguinal canal is less oblique than at a later period, and this, together with imperfect obliteration of the processus vaginalis, is a predisposing cause of inguinal hernia. Cellular adhesions between the glans penis and prepuce are extremely common in infants and young children; the union of the two structures may be limited to the area immediately in front of the retroglandular sulcus, or may involve the whole or the greater part of the opposed surfaces. In little girls similar adhesions are sometimes present between the labia majora, nymphæ, or both.

Brain and Membranes.—The dura mater is so firmly adherent to the child's skull that extra-dural extravasations occur with comparative infrequency. The brain is large at birth, and grows rapidly till the seventh year, nearly doubling its weight during the first twelve months; after this its increase is slower. The sulci and gyri forming the great motor and sensory areas are clearly mapped out at birth; the remaining convolutions, forming the so-called association centres, are ill-developed, being scarcely more complicated than those of the three or four year old chimpanzee. As regards the relation of the cerebral cortex to the skull, it is to be noted that the Sylvian fissure always lies above the squamous suture, and underneath the parietal bone; the Rolandic fissure forms a smaller angle (52°) with the mesial plane than in adult life, and is, owing to the smaller development of the frontal lobes, situated somewhat farther forward.

At birth, the spinal cord descends to the level of the second lumbar vertebra, while the dura mater reaches the third piece of the sacrum.

CHAPTER II.

PHYSIOLOGY.

Contents.—**Growth of the Child**—Height—Weight—Head—Thorax—**Circulatory System**—Circulation in the Fœtus—Heart—Pulse—Lymphatic System—**The Blood**—**Respiratory System**—**Alimentary System**—Dentition—Sucking—Salivary Secretion—Gastric Digestion—Intestinal Digestion—Pancreatic Juice—Intestinal Juice—Bacteria of the Intestinal Tract—Fæces—**Urinary System**—Act of Micturition—Amount of Urine—Specific Gravity—Characters of Urine—**Integumentary System**—**Temperature**—**Nervous System**—Brain—Special Senses—Emotions—Sleep—Development of Language.

A CLEAR knowledge of the physiological processes in infancy and childhood is necessary for the proper comprehension of the peculiarities of disease in children. For it is not so much the fact that the diseases themselves differ at this period from those occurring in adult life, as that the metabolic processes, and to a less extent the structure of the organs themselves, show a wide variation from those of the fully grown. Thus some organs which are of considerable importance in infancy are of relatively small value in later life, and *vice versâ.* Above all, one must constantly bear in mind that in the young, not only has the upkeep of the organism to be maintained, but its upbuilding has also to be effected. This will necessitate a relatively larger supply of nutritive material; particularly is there need for a liberal supply of fats, which are especially required for the formation of nerve cells and fibres and for the growth of bones. The carbohydrates likewise must be present in considerable quantity to provide for the maintenance of the animal heat in the infant; proteids and salts must also be well represented in the food for the proper growth of the various structures of the body.

With the processes of construction are closely associated the facts that the arteries are relatively wide in infancy, and the circulation of the blood rapidly carried on; that the lymphatic system of the child is also large; and, because the metabolism is more active, that the quantity of carbonic acid given off is proportionately greater than in the adult. In the young tissues there is a larger quantity of water, which is needed for the removal of the products resulting from this more rapid metabolism; and, since the amount of oxygen taken into the lungs is greater than that given off as carbonic acid, there is a gradual accumulation of oxygen-containing compounds in the body. In this chapter, therefore, we shall consider in some detail the peculiarities of the physiological processes in infancy and childhood.

GROWTH OF THE CHILD.

Height.—At birth the average length of the male child is 19¾ inches; in the female it is somewhat less. During the first two years the growth is 11 or 12 inches, in the third year 3 to 4 inches, during the next six years 2 to 3 inches annually. About the ninth year in girls and the eleventh year in boys the rate of growth is less, two years later it again increases, and by the thirteenth year in girls and the sixteenth year in boys it reaches its maximum. During the twelfth and thirteenth years girls are taller than boys: at all other periods the latter have the advantage.

At birth, the trunk is relatively long, and the extremities short: after the second year, however, the growth of the arms and legs is much more rapid than that of the body. The ultimate stature to which an individual attains is chiefly governed by the length of the lower limbs. As a rule, rachitic children will be found to be below the average height.

TABLE OF HEIGHT AT VARIOUS AGES.

Age.		Height in inches (approximately).		
At birth in both sexes,		19¾		
1 month	,,	21¼		
2 months	,,	22½		
1 year	,,	27½		
2 years	,,	31		
3 ,,	,,	34		
8 ,,	,,	47		
12 ,,	in boys,	55	in girls	56
13 ,,	,,	57	,,	58
14 ,,	,,	59	,,	60
15 ,,	,,	62½	,,	61
16 ,,	,,	64¾	,,	61¾

Weight.—The weight of the newly-born child is about 7½ lbs. Here again the difference between the sexes is slightly in favour of the male. During the first three days of life the body-weight diminishes to the extent of about nine per cent., but this loss is made up by the tenth day or so. Normally, during the first half-year the weekly gain is about four ounces, during the next six months a little less. At the end of six months the weight is 14 lbs.; at one year, 21 lbs.; during the second year there is an increment of 9 lbs.; during the third, of 4 lbs., an annual increase which is maintained until the tenth year, after which period it becomes greater. In breast-fed children the growth is more rapid and uniform than in those fed by hand. The weight alone is, however, not a guarantee of health; rickety and scorbutic children are often abnormally heavy. Increase in weight and height do not go hand in hand, the former being more rapid at one time, the latter at another.

TABLE OF THE WEIGHT OF CHILDREN.

Age.	Boys.	Girls.
6 years,	43·2 lbs.	41·3 lbs.
7 ,,	47·7 ,,	45·8 ,,
8 ,,	52·6 ,,	50·0 ,,
9 ,,	57·4 ,,	55·1 ,,
10 ,,	62·7 ,,	60·3 ,,
11 ,,	68·8 ,,	65·8 ,,
12 ,,	73·6 ,,	73·0 ,,
13 ,,	79·1 ,,	84·9 ,,
14 ,,	88·7 ,,	94·9 ,,
15 ,,	103·9 ,,	103·2 ,,
16 ,,	114·6 ,,	110·1 ,,

(*W. T. Porter*).

Head.—Owing to pressure during the process of parturition, the head of the newly-born child almost invariably exhibits some alteration in shape. The distortions are variable and to some extent characteristic of the nature of the labour as well as of the presentation. The asymmetry is further increased by the presence of the caput succedaneum. In the course of a day or two, however, the cranium assumes its normal contour. The average circumference of the head (measured in the occipito-frontal diameter) is 13¾ inches. The growth of this circumference during the first year is about 4 inches, during the second, about 1 inch, and from the third to the fifth years 1½ inches. After this period the rate of increase is slow; by the tenth year the circumference is only ½ inch larger than at the fifth, and by the fifteenth, only ¾ inch larger than at the tenth.

The size of the anterior fontanelle increases, though not proportionately to that of the head, up to the ninth month. At the end of the first year its diameter should be approximately 1 inch; it usually closes about the eighteenth month or soon afterwards, and if distinctly open at the end of the second year it is to be regarded as abnormal and should lead to the suspicion of rickets or hydrocephalus. In many poorly fed children it closes early; in some who are quite healthy not until the end of the second year. The posterior fontanelle is usually obliterated by the seventh to the ninth week, and the main sutures are ossified before the end of the first half year. During the first twelve months the head is often asymmetrical, or flattened posteriorly, from the child lying too much and exerting undue pressure on the yielding cranial bones.

Thorax.—At birth the circumference of the chest is about 13¼ inches; at the twelfth month about 18 inches; by the end of the second year, 19 inches; by the third year, 21 inches; and in a child of ten it should be about 25 inches. If in the third year the circumference of the head be greater than that of the thorax, some abnormal condition is present. The external antero-posterior diameter of the chest of the infant is about equal to the transverse, but the latter increases much more rapidly than does the former.

CIRCULATORY SYSTEM.

The **circulation in the fœtus** is very different from that carried on in extrauterine life. The purified blood returns from the placenta by the umbilical vein; a certain quantity passes directly into the inferior vena cava by the ductus venosus, but the greater proportion enters the portal vein, passes through the liver to the hepatic veins, and reaches the inferior vena cava near its entrance into the right auricle. The blood from the inferior cava is directed by the Eustachian valve through the foramen ovale into the left auricle, thence it passes into the left ventricle, and by the aorta to the head and upper part of the body. It then returns by the superior vena cava to the right auricle, through which it flows into the right ventricle, whence it is driven into the pulmonary artery. Very little blood, however, reaches the lungs, the greater proportion passing by the ductus arteriosus into the aorta. Thence a certain amount is distributed to the lower extremities, while the greater part again reaches the placenta by the hypogastric arteries. As a result of this arrangement freshly oxygenated blood is constantly supplied to the head and upper extremities.

With ligature of the cord the circulation through the umbilical vein and arteries and through the ductus venosus ceases. Thrombi begin to form in the cut ends of the vessels; within a few days the whole lumen is occluded, and eventually the disused artery or vein is represented merely by a fibrous cord. Owing to the slight development of muscular fibres in the coats of the veins as compared with the arteries, cessation of the circulation in the latter structures precedes that in the former. Being deprived of its blood supply, the remnant of the cord dies, and is cast off in the course of five or six days.

With respiration and distension of the lungs the circulation through the ductus arteriosus ceases almost immediately, and the structure itself is rarely found open after the tenth day. For some weeks before birth the blood-flow through the foramen ovale is considerably lessened by the growth of the septum. After the first week of extrauterine life but little passes through it, although complete closure does not take place till about the middle of the first year or, it may be, much later. The ductus venosus is closed about the tenth day.

Heart.—At birth the wall of the right ventricle is almost as thick as that of the left, being as 6 : 7; with extrauterine life, the latter begins to increase rapidly, so that by the end of the second year the proportion is as 1 : 2. In infancy the size of the heart in relation to the body is greater, and at the seventh year less, than in adult life.

Pulse.—The pulse is much more rapid in the infant than in the adult, and the following table may serve to show approximately its rate at different ages :—

Birth, ...	130 to 140 per minute.
End of 1st year, . . .	120 ,,
End of 2nd year, . . .	110 ,,
End of 5th year, . . .	90 ,,

A gradual slowing occurs after this period.

Excitement or muscular exercise increases the rate very greatly, and the most trivial causes may disturb it both in rapidity and rhythm. When rapid, the pulse of a child is often irregular without apparent clinical significance. This may be due to the, as yet, undeveloped structure and function of the pneumogastric nerves, leading to defective inhibitory power—a view supported by the results got from stimulation of the exposed vagi in young animals. At birth the pulmonary artery is, compared with the aorta, relatively wider than in adult life; the ratios at these periods being as 47 : 36 and as 47 : 44 respectively.

The whole extent of the cardiovascular system is traversed in about 12, as compared with about 22 seconds in the adult. Renewal of blood in the tissues is therefore extremely rapid, and as the arteries are wide in proportion to the capacity of the heart the blood pressure is always low in children.

The **Lymphatic System** is relatively highly developed; there is, therefore, a far larger supply of lymph in the tissues of early life, a fact which probably is intimately connected with the wonderful recuperative power shown by infants and young children.

THE BLOOD.

In the newly-born the blood forms only $\frac{1}{19}$ of the total weight of the body, a proportion considerably smaller than that ultimately attained. The plasma is more watery, and, owing to the smaller quantity of fibrinogen present, is less coagulable than in after life. At, and immediately after birth, the **red corpuscles** show more variety in size, are richer in stroma, and are less resistant to reagents than those of the adult. Their number is, however, greater; this is probably partly due to a decrease of the total volume of blood from withdrawal of fluid from the body. After the second day their number gradually lessens and reaches its minimum during the second year. The number of red corpuscles is greater in cases where the cord is tied late; variations according to ingestion and excretion of fluid are larger than in the adult; a slight oligocythæmia is not uncommon in artificially fed children.

In the early embryo probably all the red corpuscles are nucleated (erythroblasts); as intrauterine development proceeds their number becomes less and less, until in the mature child comparatively few are to be found. Most are normoblasts, and it would appear that their numerical limit is a proportion of four or five to every hundred leucocytes. After birth they rapidly disappear from the circulation.

The so-called "shadows" (*Schatten*) seen in many specimens are probably red corpuscles which have been deprived of their hæmoglobin by some error in the preparation of the slide.

At birth the percentage of hæmoglobin is high—about 105 with Gower's instrument; it reaches its minimum about the third week, and begins to rise again about the sixth month. From 60 to 80 per cent. must be regarded as a normal figure in infants and young children. The hæmoglobin of a newly-born child has been shown to offer more resistance to the action of reducing agents than does that of a later period.

The **specific gravity** of the blood corresponds directly with the amount of hæmoglobin present.

In a given volume of blood the **white corpuscles** are twice as numerous as in the adult, being 17,000 or 18,000 per cubic millimetre. As might *a priori* be expected, the younger (mononuclear) forms predominate and form at least 50 to 60 per cent. of the total leucocytes. The multinuclear cells are relatively few, while the number of those bearing eosinophile granules appears to vary very greatly.

RESPIRATORY SYSTEM.

Though the lungs grow rapidly during the first months of life, they remain relatively small during the whole of childhood. The chest wall is thin, and, owing to the framework being chiefly cartilaginous, it is elastic and yielding; in consequence of which, temporary or permanent distortion is liable to ensue. Distension of the pulmonary alveoli begins with the first cry; the entire organs are not at once filled with air, but the superficial lobules take on their function earlier than the rest of the lung. The order in which the different areas become inflated is the following:—the anterior margins, the upper, then the lower lobes, and, last of all, the extreme bases. As a whole the process is a gradual one, and is not completed before the second day; in abnormal circumstances—as in delicate and weakly children—it may be delayed up to a period of several weeks; should this be so, the longer the fœtal condition is maintained, the greater is the difficulty of complete inflation. Respiration is chiefly diaphragmatic, partly owing to the more horizontal position of the ribs and their cartilages, and partly owing to the imperfect development of the intercostal muscles. The rate of respiration is greater than in the adult:—

At birth,	about	45	per minute.
End of first year,	,,	30	,,
End of second year,	,,	25	,,
End of sixth year,	,,	22	,,
End of twelfth year,	,,	20	,,

The respiratory rhythm is easily disturbed; it is very apt to become irregular, and as the lungs often expand unequally, variations both in depth and rhythm are frequent. Cheyne-Stokes respiration, or a close approach to it, readily supervenes in early life. A child can hold its breath for a long period; consequently, the intervals between inspiration and expiration may vary very considerably. At first, breathing is entirely nasal, and some little time elapses before the child learns to use its mouth for this purpose. As the upper respiratory passages are small, it follows that any affection narrowing the lumen will profoundly disturb respiration.

The **interchange of gases** is greater than in the adult; twice as much carbonic acid is given off in proportion to the body weight, and the absorption of oxygen is relatively even greater. There is, therefore, a steady accumulation in the body of combustible oxygen-containing compounds.

ALIMENTARY SYSTEM.

Dentition.—The eruption of the milk teeth occurs approximately at the following periods:—

Two lower central incisors,	6 to 8 months.
Four upper incisors,	8 to 10 ,,
Two lower lateral incisors,	12 to 14 ,,
Four first molars,	12 to 14 ,,
Four canines,	18 to 20 ,,
Four posterior molars,	28 to 32 ,,

At the first year, therefore, a healthy child has usually six teeth, at the eighteenth month twelve, at the second year sixteen, and at two and a half years twenty.

The permanent teeth appear in the following order:—

First molars,	6 years.
Central incisors,	7 ,,
Lateral incisors,	8 ,,
First bicuspids,	9 ,,
Second bicuspids,	10 ,,
Canines,	12 ,,
Second molars,	12 to 14 ,,
Third molars,	17 to 25 ,,

Although the foregoing tables show the approximate dates of eruption of the milk and permanent teeth, it must be remembered that there may be wide variations in the time of their appearance. Often there is a family peculiarity in this respect; rickets is, however, by far the commonest cause of delayed dentition, though in quite healthy children the teeth may not appear for several months after the usual date. In the majority of children with congenital syphilis, as well as in a small percentage of cases of rickets, the teeth appear at an earlier date than normal. Ossification of the skull and dentition, as a rule, proceed simultaneously; if one is delayed the other is also delayed. In cretinism the eruption of the teeth is retarded. One or more teeth, usually the central incisors, may be present at birth; these should not be removed unless they interfere with nursing.

Sucking.—Very often as soon as the child is born it begins to suck at its finger. The act is a purely reflex one, the motor nerves concerned being the facial, hypoglossal, and inferior division of the fifth. Sucking is chiefly carried out by the depressors of the hyoid bone pulling the tongue and the floor of the mouth downwards and backwards, whilst the communication between the mouth and pharynx is cut off by the descent of the soft palate to the root of the tongue. The sucking pads already described distribute the atmospheric pressure and prevent in-drawing of the cheeks in the act of sucking. A vacuum is, therefore, produced into which the milk flows.

The **salivary secretion** is scanty at birth, and has little or no amylolytic power. By the second or third month there is distinct evidence of the presence of ptyalin, but until the end of the first year it is not present in any great amount. Since all a child's food is in the form of liquid, saliva is not required to facilitate the process of swallowing.

Gastric Digestion.—As the stomach is extremely small at birth, and as its muscular coat is thin and imperfect, food must be given in small quantities and at short intervals. If too much be allowed, regurgitation takes place, and the ease with which this, as well as the act of vomiting, occurs in the child is to be ascribed to the vertical position of the stomach and to the weakness of the sphincter at the cardiac orifice. In infancy the stomach acts mainly as a reservoir from which food is passed into the intestine; the gastric digestion is at this time only a partial one. Hydrochloric acid and pepsin are both present in the stomach of the newly-born child. In infancy the reaction of the gastric contents is acid in the fasting condition, free hydrochloric acid being usually then present. In fifteen minutes after feeding, the reaction under normal circumstances is invariably acid, but free hydrochloric acid cannot yet be demonstrated. Not till an hour afterwards, and then not constantly, can its presence be detected. This is due to the fact that the acid combines with the casein so abundantly present in all milk, especially in that of the cow. Free acid is found in largest amount about two hours after the meal; that is, when much of the food has passed into the intestine.

Lactic acid is a more constant constituent of the stomach contents in infancy than later: its source is the milk-sugar; rarely, if ever, is it found in the free state, and it is questionable whether it has any digestive action. The rennet ferment is independent both of hydrochloric acid and pepsin, and acts in acid, neutral, or alkaline media.

The first change which the milk undergoes in the stomach is that of coagulation. In the case of human milk fine flocculi result; in that of the cow, on the other hand, a dense firm curd is formed. Under the influence of pepsin and hydrochloric acid the conversion of this into soluble forms of albumin begins, but is only imperfectly performed in the stomach. A part of the milk leaves the stomach soon after entering the organ, and even during the first half hour a fair quantity passes into the intestine. At the end of an hour the stomach of a breast-fed infant is usually empty, while when cow's milk is used a somewhat longer time elapses before it reaches the bowel. The duration of gastric digestion varies with the age of the child and the nature of the food. During the first month the stomach is empty in from one to one and a-half hours after a meal, from the second to the eighth month in two hours; cow's milk remains in the organ from a half to one hour longer. The size of the meal causes some variation in the length of time it remains in the stomach, as also does any disordered condition of the digestive function.

Gas is found in the stomach within half an hour after the child is born, and in twenty-four hours the intestines are similarly distended. The bacteria of the stomach are few, and their presence is of little importance.

Intestinal Digestion.—In infancy, as we have already seen, the proteids are comparatively little altered by the gastric secretion; it is, therefore, in the intestine that the principal part of digestion and absorption is carried out.

Pancreatic juice even at birth contains trypsin, and is also able to emulsify fat. At this period, however, it has no diastatic power; this it acquires, though feebly, within the first six months, and up to the end of a year the action is a weak one.

The **intestinal juice** is chiefly diastatic in function; its reaction is alkaline, consequently it is of assistance in tryptic digestion and the emulsification of fats. The bowel contains abundance of lymphoid tissue. This peculiarity is probably related to the large amount of fat which requires to be absorbed in order to permit of the healthy growth of the infant. Milk-sugar being the only element of the food completely absorbed, there is always, even in breast-fed children, a certain amount of residuary fat and proteid in the fæces. In children fed on cow's milk the quantity of fat, and still more of proteid, remaining unabsorbed is considerably greater than in sucklings. In cases of dyspepsia the food residue contains a larger proportion of undigested elements, chiefly proteid, to a less extent fats, and to a still less degree carbohydrates.

The **biliary secretion** appears very early in fœtal life, and the large size of the liver points to its being an organ of major importance. The bile is poorer in inorganic salts and in bile acids than in later life, but has otherwise no distinguishing features.

Bacteria of the Intestinal Tract.—At birth no organisms are present in the intestinal canal; within twenty-four hours, however, they are found everywhere throughout it. During the period of milk feeding, two forms only are normally present: the bacillus lactis aërogenes and the bacillus coli communis. The former is found in the upper part of the small intestine; for its growth milk-sugar is required; this it breaks up into lactic acid, carbonic acid, and other substances. It has no action on fat or proteid. The latter is chiefly found in the lower bowel, and, under certain conditions, may become pathogenic. The alteration of the diet from milk to mixed food leads to the disappearance of the bacillus lactis aërogenes, but not of the bacillus coli communis.

Fæces.—During the first fortnight there are usually three to six stools daily, after the first two months two daily. The average amount passed by a healthy nursling is from two to three ounces in the twenty-four hours. The stools have the colour of yolk of egg, are smooth and homogeneous in consistence, with a faintly sour smell, and, on account of the presence of lactic and fatty acids, an acid reaction. When the child is fed on cow's milk the fæces are firmer, paler, and frequently contain undigested casein; they may have an alkaline or neutral reaction. Should a large quantity of casein be present, they may have a rather cheesy odour, but as the only gases they contain are hydrogen and carbonic acid, they have no distinct fæcal smell.

In breast-fed children so complete is the absorption of proteids that these are only present to the extent of 1·5 per cent. in the dried residue of the fæces; in artificially fed infants they form a somewhat larger proportion. Fat is always present in the motions in considerable abundance; sugar on the contrary is absent, but lactic acid, a result of its decomposition, is a common constituent. Inorganic salts—chiefly those of lime—form about 8 per cent. of the dried residue; leucin, tyrosin, and other products of albuminoid decomposition are absent, as also are phenol, skatol, and (save in exceptional instances) indol. If the young infant be partaking of farinaceous foods, starch appears in the stools in fair quantity, and can easily be detected by its iodine reaction. It must not be confused with dextrin, which, if present, gives a violet, not a blue, colour.

As the child is weaned and the diet becomes a mixed one, the characters of the fæces alter and come to resemble those in the adult. The motions become firmer and darker, acquire the fæcal odour, and contain a great variety of micro-organisms. The first motions passed by the newly-born child consist of meconium; this is a tenacious, odourless, greenish or brownish substance, faintly acid, free from any trace of decomposition, and consisting chiefly of inspissated bile.

URINARY SYSTEM.

The **act of micturition** is at first involuntary and of frequent occurrence. During the first two years urine is passed once or twice an hour when the infant is awake; during sleep it is retained for from two to six hours. After the second year the bladder is emptied every two or three hours during the day, much more seldom at night. No doubt the control of the sphincters is to a large extent a matter of training, and the age at which it is thoroughly established will vary considerably. When involuntary evacuation of urine persists during childhood we have a pathological condition called **enuresis**—usually nocturnal.

The **amount** of the urine varies greatly during the first few days of life, and alarm need not be felt though the infant passes no water for from twenty-four to thirty-six hours after birth. The quantity of urine is relatively greater than in the adult, but varies much with the amount of fluid ingested and with that eliminated in the fæces and sweat.

The **specific gravity** is high in the first few days owing to the scanty supply of fluids taken. It is at its lowest point from the third to the sixth day, and thereafter increases very slowly and gradually.

Table of average daily quantity and specific gravity of urine :—

1 to 24 hours, . .	0 to 2 oz.	sp. gr. 1010 to 1012
24 ,, 72 ,, . .	$\frac{1}{3}$,, 3 ,,	
4 ,, 6 days, . .	4 ,, 8 ,,	,, ,, 1004 ,, 1008
7 days to 2 months, .	5 ,, 13 ,,	,, ,, 1004 ,, 1010
2 months to 6 months,	7 ,, 16 ,,	
6 ,, ,, 24 ,,	8 ,, 20 ,,	,, ,, 1006 ,, 1012
2 years to 5 years, .	16 ,, 26 ,,	,, ,, 1008 ,, 1016
5 ,, ,, 8 ,, .	20 ,, 40 ,,	
8 ,, ,, 14 ,, .	32 ,, 48 ,,	,, ,, 1012 ,, 1020

(*Holt.*)

Characters of the Urine.—At birth it is odourless and very pale, but after respiration is established colouring-matters rapidly appear. In early infancy it is high-coloured, in later infancy almost colourless, and, owing to an excess of mucus, has a turbid aspect. The urine of the first few days often leaves a reddish stain on the napkin ; this indicates the presence of uric acid or urates, and when tested the urine is found to have an acid reaction. Later, the reaction is neutral or but faintly acid. Urea is present in small amount at first, its quantity increases with age, though not *pari passu* with the gain in body weight. Phosphates, chlorides, and sulphates are found in the urine even at the earliest period, but only in small quantity. A trace of albumin is often present during the first few days ; it is transient and of no clinical significance. Sugar is not found under normal conditions. Microscopically, the sediment of the urine collected immediately after birth may be found to contain squamous epithelium, granular matter, crystals of uric acid, urates, and sometimes hyaline or granular casts. These are all to be regarded as entirely normal, and after early infancy the microscopic appearances of healthy urine are in no way different from those of the adult.

INTEGUMENTARY SYSTEM.

The child is born with a covering of sebaceous matter known as the **vernix caseosa.** When this is washed away the skin is seen to be more hyperæmic than it afterwards is, and is covered with fine downy hair—the **lanugo.** Desquamation of the cuticle, as a rule fine, but occasionally more marked, begins a few days after birth and is completed by the end of a fortnight, when the lanugo also falls off. The marked redness at birth gradually disappears, and in about a month the skin has assumed the pink colour which it retains during infancy. The infant's skin is softer, thinner, and tenser than the skin of the adult. Very commonly about the third or fourth day a greater or less degree of icterus appears, which gradually fades away and is completely gone in ten days or so. The **sebaceous glands** are active at birth, but the **sweat glands** do not begin to functionate for several weeks, and, indeed, for the first few months very little perspiration is noticeable.

The **lachrymal glands** do not secrete tears until about the third month. The **mammary glands** often show some swelling while the skin is hyperæmic during the first few days of life. The swelling usually goes down in about a fortnight, but for several months there may be some clear secretion from the breasts ; this contains milk globules or colostrum corpuscles.

TEMPERATURE.

Immediately after birth the temperature of the child is about the same as that of the mother. From the loss of heat by bathing, exposure, &c., it falls from one to three degrees, and then gradually rises again to 98·5° or 99°, and this is the average temperature in early childhood. The temperature is best taken in the rectum, and anything between 98° and 99·5° may be considered normal. In some cases, however, it is more convenient to take it in the groin or axilla, and then a somewhat lower reading is obtained. The heat regulating mechanism in the child is not very stable and so the temperature varies readily ; thus in a small or dark room it may fall as much as ·5° ; after a meal the rectal temperature falls considerably ; during sleep it may be from ·3° to ·9° lower than during waking hours ; crying causes it to rise distinctly, and other causes readily affect it. The chief factors which determine the differences between the temperature in the child and that in the adult are:—increased metabolism, leading to increased heat production ; large body surface relatively to weight, leading to excessive radiation ; and the comparative instability of the nervous mechanism in the child. A febrile temperature is more apt to show a remittent character than in after life.

NERVOUS SYSTEM.

The **brain** is relatively much larger in the child than in the adult. Thus in the former it forms about $\frac{1}{7}$ or $\frac{1}{8}$ of the whole body weight, whilst in the latter it forms only $\frac{1}{40}$ or $\frac{1}{50}$. The weight of the brain at birth is about 14 ounces, and it grows very rapidly indeed during the first two years of life. In the following table is shown the average weight of the brain at different ages :—

At birth, ...	14 ozs.
At end of first year, ...	28 ,,
At end of seventh year, ...	38 ,,
At end of fourteenth year, ...	44 ,,
In adult life, ...	50 ,,

(*Ashby and Wright*).

The spinal cord is of relatively much greater weight than in the adult.

At birth the multipolar nerve cells and the pyramidal tracts are not fully developed ; indeed, the medullation of the nerve fibres in the pyramidal tracts, and especially in the hemispheres of the brain, is not completed for some months after birth. This is probably the reason why the brain is not so white as in the adult. Medullation of the pyramidal fibres spreads upwards from the spinal cord ; this structure, with the bulb, pons, and cerebellum, is usually fully medullated at birth, but the myelination of the cerebral peduncles and hemispheres is delayed for some months. The cranial and spinal nerves are well developed by the end of intrauterine life. For these reasons (in part at least) the movements of the infant are at first purely reflex, and the inhibitory influence of the brain being absent, these reflex movements are much more active than in after life.

But the physiological functions of the brain of the infant differ more from those of the adult than is explained merely by the deficiencies in anatomical structure which have been demonstrated. The specialised functions of the different parts of the cerebral cortex have not been properly assumed ; hence stimulation of the various centres in young animals does not give rise to definite localised movements. Indeed, not until some time after medullation is completed can these be induced. The first movements under the power of the will are those of the hand, then come movements of the head, face, and neck, and, lastly, those of the lower limbs.

The vaso-motor mechanism is very active in the child.

Muscular contraction is very much slower than in the adult, and so tetanus is more readily produced. The great tendency which exists in infancy to convulsions and spasms of many kinds is largely explained by the facts which we have just been considering.

The reflex acts of vomiting, choking, and hiccough may occur from birth ; the last is frequently seen in the first weeks of life.

It is usually about the fourth month before the child can hold up its head properly ; this is in all probability due not to any muscular weakness, but to the absence of the power of co-ordination. About the fourth month the child usually tries to sit up, and by the seventh month, as a rule, it is able to do so. Walking is generally attempted about the ninth or tenth month, and by the twelfth month, or a little later, it is successfully accomplished. Often enough, however, the child, although quite healthy, does not walk for a few months after this date ; but if several months elapse, we must carefully examine for rickets, paralysis, and the other common causes of the want of power of progression. Creeping is usually begun some time before attempts at walking are made. The date varies greatly, and some children never creep at all.

The Special Senses—(*a*) **Sight.**—During the first week the child can merely distinguish light from darkness, and this only when a large part of the retina is stimulated. The perception of colour is later in developing ; first black and white are distinguished, then red and yellow, and, lastly, green and blue. The movements of the eye are at first inco-ordinate and unassociated. The power of fixation is probably first gained about the second or third week, then the child begins to look at objects, but co-ordinate action for general purposes is not usually acquired until the third month. This want of co-ordination in the muscles of the eye is perhaps due to the want of development in the fibres connecting the centres in the brain. The cornea is at birth only slightly sensitive; involuntary shutting of the eyelids occurs for the first time about the seventh week.

(*b*) **Hearing.**—During the first twenty-four hours of life the infant is deaf; this is due to want of air in the tympanum, and to the swollen condition of its mucous membrane. As the air passes in the hearing improves, until in the first years of life it is very acute. The ear is at first a much more important channel of information than is the eye. About the end of the second month the head is turned towards a noise, and the voices of parents are recognised at about three and a half months.

(*c*) **Touch.**—Tactile sensibility is present at birth, as also is temperature sensation. They are poorly developed, except in the tongue, but gradually become more acute. Sensibility to pain is but slightly present in the newly-born. The power of localising a sensation is not developed for some months after birth, nor does it become acute until a considerably later period.

(*d*) **Taste** is present and acute at birth. Sweet, sour, and bitter tastes can, according to Kussmaul, be recognised in the newly-born.

(*e*) **Smell**, though probably present from the first, remains imperfect for a long time.

Emotions.—About the end of the first month the infant begins to smile, and at the end of two months it seems to be able to distinguish voices, whilst about the third or fourth month it can distinguish toys. During the first and second years development of the various emotions takes place, and these are shown in the characteristic expressive movements which occur. First, we have pleasure and the reverse; then astonishment, expectation, anger, shame, and envy. The consciousness of self does not appear to exist before the end of the second year. Events which occur before the third year are not, as a rule, remembered in after life.

Sleep.—During the first few weeks of life the child should sleep all day except when it is taking nourishment—*e.g.*, it should sleep—

At birth, ...	20 to 22 hours per day.
At end of first year, . . .	15 ,, 16 ,, ,,
During second and third years,	12 ,, 13 ,, ,,
,, fourth ,, fifth ,, .	10 ,, 11 ,, ,,
,, twelfth ,, thirteenth ,, .	8 ,, 9 ,, ,,

Up to the age of four years it is well to let the child have a sleep during the day.

Development of Language in the Child*—(*a*) **Expressive Inarticulate Sounds.**—Crying, occurring as it does from birth, is of course the first of these. As the lachrymal glands are not properly developed, no tears are shed in crying for some time after birth. The child usually cries from hunger, discomfort, or pain. In screaming, the eyes are tightly closed and the mouth becomes somewhat square in shape.

---

* This short account is based on the chapter on the subject in Wyllie's *Disorders of Speech*, 8vo, Edin., 1894.

Distinct smiling is not usually observed until about the sixth week. Reflex laughing may be elicited at the second month, but this has not the joyful sound of the spontaneous laughter which appears later. About the fourth month incipient laughter may be noted, and at the sixth month the laugh is merry. An infant has been noticed to return a smile at the fourth month, and at six months to look as if going to weep when the nurse pretended to do so. Children produce a grunting sound of a more or less expressive character from the third month.

(*b*) **Facial Expression and Gesture.**—Within a few days of birth frowning initiates an attack of screaming. A distinct frown from unpleasant food has been observed towards the end of the second month. An expression of disgust has been shown at the fifth month; of guilt, at two and a-half years. Blushing may be observed about the second to third year, especially when there is an hereditary tendency to marked blushing. Shyness, shown by the child averting the eyes, is usually seen before blushing appears.

Gestures of affirmation and negation are not noticed till after the first year. Before it can speak at all the child can usually point with the finger to persons or objects named. Between the second and third years one observes the first appearance of the various passions: jealousy, pride, pugnacity, generosity, obedience, ambition.

(*c*) **Automatic Exercise of the Speech Organs.**—Babbling or prattling, in which the oral articulative mechanism takes part, is first heard about the second month. "Am" or "ma" is usually the first sound produced. The child soon comes to use a large number of consonants and vowels. Crowing consists in the loud and joyous production of the sounds used in babbling. It is, as a rule, heard first during the third month. Mimic reading is noticed about the fifteenth or sixteenth month Echolalia—where the child produces a sound imitative of something just heard—is much easier for the child than is the spontaneous utterance of the same word.

(*d*) **Intelligent Speech.**—The power of understanding words spoken, necessarily precedes the power of producing words. Certain words, such as "papa," "mama," are understood towards the end of the first year. Children frequently use words of their own invention, and although these are in most cases apparently imitations of words which have been heard, this is not always the case. These words are used from about the twelfth month onwards. Intelligent speech production is considerably later in appearing than are babbling and echolalia, and, as has already been said, the child has great difficulty in voluntarily producing, or producing to command, sounds which are already familiar in babbling and echolalia.

The child has, as a rule, little difficulty with any of the vowels, except *i* (*ee*) and *u* (*oo*). Of the consonants it first learns to produce the labials, or those produced at the first stop position, that is, *p*, *b*, *m*: next the anterior linguo-palatals, or those produced in the second stop position—viz., *t*, *d*, *n*. Those produced in the third stop position—viz., *k*, *g*, *ng*—are much later in appearing, whilst the fricatives *r* and *l* give much difficulty, as also, though in a less degree, do *sh*, *s*, *ch*, and *y*. In infants, "smudging" or "scamping" of consonants is common.

Preyer thinks that children in sound condition mostly walk before they speak, and understand what is said long before they walk.

CHAPTER III.

FEEDING IN INFANCY AND CHILDHOOD.

Contents.—**Infant Feeding** — **Elements of the Food** — **Natural Feeding** — Human Milk — Maternal Nursing — Weaning — Premature Weaning—Contra-indications to Maternal Nursing—Wet Nursing—**Artificial Feeding**—Composition of Cow's Milk—Cow's Milk as a Diet for Infancy—Rules for Artificial Feeding—Sterilised and Pasteurised Milk—Peptonised Milk—Humanised Milk—Condensed Milk—Whey—White Wine Whey—Infants' Foods—Raw Meat Juice — Egg-albumin and Water — **Feeding in later Infancy and Childhood.**

I. INFANT FEEDING.

ELEMENTS OF THE FOOD.

In the infant a diet has to be provided which is suitable for the growth of the body, and as the digestive power is comparatively weak this diet must be of such a nature as to be easily assimilable.

Proteids are necessary in considerable amount for the upbuilding of many of the structures of the body, of whose protoplasm they form a very important constituent. If they are deficient in the food for any considerable length of time, anæmia, along with the general symptoms of mal-nutrition, is very apt to ensue. At the same time, owing to the slightly developed digestive capacity of the infant, the opposite error of giving too much proteid must be avoided.

Hydrocarbons.—It is particularly essential that the infant's food should be comparatively rich in fats. The reason for this is that, in addition to being one of the chief sources of animal heat and leading to the storage of fat in the body, they are necessary for the proper construction of certain tissues—the nerve cells and fibres, and particularly the bones. That they are required for this latter end is a view very generally held in this country, where defect in the diet is looked upon as the one great cause of rickets. It certainly would appear that when they are deficient (especially if at the same time proteids are scanty) the disease is very likely to ensue. The natural laxative action of fat is also extremely important.

Carbohydrates have as one of their chief functions the generation of animal heat, and as at the period of life under consideration the muscles (being little used for movement) cannot act to any marked extent as heat producers, the value of these food-stuffs is high, and they should form at least one-half of the solids of the diet. They are partly converted into fat, and therefore assist in its storage in the body and lead to an increase in the weight of the child. The form of carbohydrate present in human milk is lactose, which, owing to its solubility, is easily assimilated. But maltose or cane sugar may be substituted for lactose, if there is any reason why the latter ought not to be given. On account of the very deficient diastatic action of the digestive fluids during the first few months of life, carbohydrates cannot be supplied to the infant in the form of starch. When too large a quantity of these food elements is present, the child becomes fat and heavy, has not a healthy appearance, is invariably flabby, and does not resist disease well. It is often anæmic and rachitic.

Mineral salts are very essential for the proper development of the osseous textures of the body; they are also necessary for cell growth in general. The most important of them are calcium phosphate, potassium carbonate, and sodium and potassium chloride.

Water is required for the solution of some of the elements of the food and for the suspension of others. As the metabolism of the child is relatively great, a correspondingly large quantity of water is needed for its accomplishment, as well as for the elimination of waste products.

In addition to containing the proper food elements the dietary of the child must contain them in due **proportion**. A further essential is that the food be of an **antiscorbutic** nature. The exact factors here concerned are not as yet well known, but it is sufficient to note that fresh milk has this property in a marked degree, while it is entirely absent from the various forms of condensed and artificial foods.

NATURAL FEEDING.

Human Milk.—It has been abundantly proved that as human milk is the food provided by nature for the infant, it is also by far the most satisfactory, and the one which should be given where at all possible. In many cases, however, it is impossible for the mother to nurse her child, and it therefore becomes necessary to substitute some other form of food. It is generally recognised that the substance which most nearly approaches to human milk in its composition will, as a rule, form the most suitable substitute for it. It is therefore of importance to be aware of the main facts known as to the chemistry of human milk.

Composition.—Human milk is a bluish-white fluid, sweetish in taste, usually of alkaline reaction, occasionally neutral, but, at least in health, never acid. Its specific gravity is about 1,027 to 1,032. When examined microscopically it is found to contain a large number of fat globules of fairly uniform size, some granular matter, and at times a few epithelial casts from the ducts of the breast. The fat globules are larger in the milk of the woman than in that of the cow. Human milk naturally varies somewhat in chemical composition, but approximately is made up as follows :—

Proteids, ...	1·8 to 2	per cent.
Carbohydrates, ...	7	,,
Hydrocarbons, ...	4	,,
Salts, ...	·2	,,
Water, ...	86·8 to 87	,,

The **proteids** present are principally casein and lactalbumin, in the proportion of one of the former to two of the latter. The lactalbumin is in solution, the casein, combined with calcium phosphate, is probably in suspension ; it is coagulated by lactic acid and also by the rennet ferment ; these reagents have no such action on the lactalbumin, which is therefore present in solution in whey. It may, however, be precipitated from this by the action of heat, and so far closely resembles serum albumin. On account of the large amount of lactalbumin which it contains, human milk forms only a fine flocculent curd in the stomach.

The **fats**—the glycerides of oleic, stearic, and palmitic acids—exist in the form of fine globules (the milk corpuscles) in a state of suspension.

Carbohydrates.—Lactose is the only form of sugar found in human milk ; it is soluble, and, therefore, easily absorbed. At times part of it becomes decomposed in the alimentary tract, and gives rise to lactic acid.

Of the **salts** present in human milk the most important are :—

Calcium phosphate	forming about	24	per cent	of total salts.
Potassium carbonate	,,	23·5	,,	,,
Sodium chloride	,,	21·5	,,	,,
Potassium chloride	,,	12	,,	,,
Potassium sulphate	,,	8	,,	,, (*Holt*).

Although, owing to the presence of some organisms in the ducts of the woman's breast, the milk is not absolutely free from germs when swallowed by the child, if the mother be healthy, it may for all practical purposes be considered as sterile.

Colostrum.—The milk secreted during the first few days differs greatly from that afterwards present. It is yellow, strongly alkaline, coagulates in large masses on heating or, at times, even spontaneously. Its specific gravity is high—1,040 to 1,046—the proteids are present in larger, the fats and carbohydrates in smaller amount than in the secretion of later periods. The salts too are somewhat excessive. Its approximate composition is:—

Proteids, ...	5·71 per cent.
Fats, ...	2·04 ,,
Carbohydrates, ...	3·74 ,,
Salts, ...	·28 ,,
Water, ...	88·23 ,,

To this the name of colostrum is given; when examined under the microscope the fat globules are seen to be of unequal size, and degenerated epithelial cells (colostrum corpuscles), on which the yellow colour of the fluid depends, are found. Colostrum corpuscles disappear from the milk by about the tenth or twelfth day.

Quantity of Milk Secreted.—The amount of a woman's milk varies to a considerable extent. Very little is secreted during the first two or three days; then the breasts become tense, and by the end of the week the daily amount secreted is about 10 to 16 ounces.

During the second week it is . .	about	13 to 18 ozs.
,, fourth ,, ...	,,	16 ,, 26 ,,
,, second and third months	,,	20 ,, 34 ,,
,, fourth, fifth, and sixth months	,,	24 ,, 38 ,,
,, seventh, eighth, and ninth months	,,	30 ,, 40 ,,

(*Holt*).

Until the eighth week the amount increases rapidly; thereafter much more slowly.

Variations in the Amount and Composition of Human Milk.—As might be expected, the quality of the milk depends largely on the general condition of the mother. Prolonged illness, frequent pregnancies, and other debilitating causes will lead to a secretion nutritively poor by reason of deficiency of the fats, though the proteids may in some such instances be increased. The milk of women in the common child-bearing period is usually richer in fat than is that of very young women and of those over thirty-five. Strongly developed muscular women do not, as a rule, supply better milk than those of smaller and feebler muscularity. Menstruation is commonly regarded as interfering greatly with the quality of the milk secreted; probably, however, it does so but rarely. Should pregnancy ensue during lactation, the milk usually becomes defective both as regards its quality and quantity. As is only natural, the food greatly affects the composition of the milk: a liberal nitrogenous diet increases both fats and proteids, vegetables in excess rather tend to decrease them: insufficient nourishment leads to a marked deficiency of fat, with or without alteration in the quantity of nitrogenous material. The quantity of milk secreted is increased when the diet contains much fluid, purgatives which cause watery evacuations have, on the other hand, an opposite effect. Alcohol (usually given to nursing women in the form of malted liquors) besides increasing the flow of milk, renders it richer in fats and proteids. Its use should, however, be discouraged, as also should that of strong tea and coffee, and all seasonings and highly spiced food.

While nursing, the woman should have a plentiful diet of plain and, for the most part, non-nitrogenous food; she should rely largely on milk, farinaceous substances, gruels, &c. Nervous impressions sometimes produce a profound alteration in the secretory function of the mammæ; in such cases the milk may give rise to digestive disturbances in the infant.

Some drugs affect the milk considerably, others little or not at all. Belladonna always decreases the secretion, and, if given in large doses, may directly affect the infant. Opium given to the mother may also have some effect on the child. It is said that iodides lessen glandular action and so diminish the secretory activity of the breast. These salts as well as the bromides are excreted in the milk and may affect the child. Hydragogue cathartics greatly lessen the flow of milk, and should, therefore, unless this action is desired, be avoided during lactation. In general terms, in addition to the substances mentioned, all aromatic drugs, such as menthol and creasote, and those containing vegetable colouring-matters (which are very liable to be carried over in the milk) are contra-indicated, and should not be administered at this period.

While, as we have seen, human milk is practically sterile in health, under certain conditions—puerperal septicæmia, affections of the mammary glands, &c.—it may contain numerous micro-organisms. In such cases the child will probably suffer. In some acute fevers the milk may contain the germs of the disease, and it is possible that this may be the case in tubercle and other constitutional conditions; here, however, inasmuch as from the nature of the malady lactation is usually impossible, the existence of the bacterial contamination of the milk is of little practical importance.

Clinical Examination of Human Milk.—This is not very often necessary. The reaction should be noted and the specific gravity taken with a suitable instrument. The quantity of sugar is not very liable to variations; what has then to be determined is the quantity of fat and proteid present. For the former purpose a definite quantity of milk is placed in a bottle of suitable calibre, and after a stated number of hours the thickness of the layer of cream on the top is carefully noted. With the information now gained one can roughly discover whether the proteids are excessive, deficient, or normal. Since with a large quantity of fat the specific gravity is lowered, while with a large quantity of proteids it is raised, it follows that if the specific gravity be high and the fat abundant the proteids are also abundant. If the specific gravity be high and the fats scanty, the proteids will be about normal; if the specific gravity be low and the fats low, the proteids are deficient.

Maternal Nursing.—During the two days succeeding delivery there is normally very little secretion of milk. Unless under exceptional circumstances it is not, however, on this account necessary to give the infant artificial food during this period. Though the mammary secretion is as yet scanty, it is well to put the child on the breast after the lapse of a few hours, by which time the mother will have somewhat recovered from the exhaustion of labour, and this should be repeated every three or four hours until the function of the gland is fully established. The advantages gained by this procedure are that the contraction of the uterus is assisted, that the nipples are well drawn out while the breasts are still lax, and that the secretion of milk is stimulated. After the fourth day the supply is usually copious.

When the infant is put to the breast it should lie on its side, while the mother, leaning a little forward, regulates the flow of milk through the nipple by gentle compression with the fingers. The breasts should be given alternately, and, as a rule, the child should be allowed to suck until it is satisfied. After each nursing the nipples ought to be carefully washed and dried.

It is extremely important both for the sake of its own health and that of the mother, to educate the child as soon as possible in regular habits with regard to suckling. The mother must be warned against giving the breast whenever the infant cries, and it should be explained to her that the cry is frequently not due to hunger but to indigestion, and that whilst feeding will soothe the child for the moment, the condition will thereby be ultimately aggravated.

It is impossible to lay down definite rules for every case, but the following suggestions will be found suitable in the majority of cases.

During the first four weeks the child should be put to the breast every two hours between five o'clock in the morning and eleven o'clock at night. During the night there should be only one nursing, and this should be given up as soon as possible—usually from the second to the third month. From the eighth to the twelfth week the intervals between the meals should be longer—two and a-half hours. and by the fourth month three hours should elapse. The size of the child's stomach has during this period been rapidly increasing, therefore the duration of each meal must also be lengthened. Towards the end of lactation it is sufficient to feed the child once every four hours.

If the child be thriving, no food beyond the breast-milk should be given till about the tenth month. It often enough happens, however, that the mother's milk is not in itself sufficient after the sixth or eighth month. The plan then to be adopted is that of so-called mixed feeding, giving the breast and the bottle alternately or as may be required. If nursing be protracted beyond the twelfth month the health of the mother is apt to suffer and the infant becomes anæmic, flabby, and, perhaps, rachitic. In such circumstances it must be immediately weaned.

Weaning.—In health this usually takes place about the twelfth month, although for various reasons it may occur at an earlier or later date. Sudden weaning is now seldom carried out, and should never be advised, except under very unusual circumstances. The process should, as a rule, occupy several weeks, one nursing in the day being supplanted by feeding, then another and another until lactation has completely ceased. This method is much better for the mother, whose breasts are apt to become painful if weaning be sudden, and obviously much better for the child than a process by which its diet is suddenly completely altered. If possible the substitution of artificial for natural feeding should be avoided when the weather is very warm ; the reason for this lies in the extreme liability of cow's milk (the commonest and best substitute) to become decomposed and to set up gastro-enteritis. Though it is by no means absolutely necessary, it is well to select an interdental period in which to wean.

Premature Weaning.—From various circumstances weaning may require to be carried out at a much earlier date than usual, and sometimes it may need to be done abruptly. The necessity for this may arise from the existence of some disease in the mother, such as acute illness, cancer, consumption, kidney disease, &c., or, more frequently, simply on account of a general debilitated condition. Syphilis, if acquired after the birth of the child, necessitates weaning lest the offspring be infected. Pregnancy and sometimes (though not commonly) the re-appearance of the catamenia during the period of lactation are also indications for the interruption of breast-feeding.

On the part of the child circumstances may arise which require that it be weaned ; when he fails to gain, or still more when he loses, weight ; becomes pale, fretful, and remains too long at the breast, yet leaves it without appearing satisfied ; in short, when he does not appear to thrive properly, some form of substitute feeding is needed. Before having recourse to this we may, however, try to improve the mother's milk by a suitable diet. The mother's milk may fail in its object through being too rich in proteids and fats—usually the result of a too generous diet. On the other hand, and more often, the milk is poor ; the quantity may be deficient, or, without this, the quality may be defective and too low a percentage of fat and proteid, or of fat alone, may have brought about the malnutrition of the child. With signs of malnutrition the stools of the infant are usually of unhealthy appearance ; hard, dry, and lumpy, or, more frequently, loose, greenish, or yellowish, containing mucus and undigested food.

When the mother is unable to nurse her infant entirely, yet has a considerable quantity of milk in the breast, mixed feeding is better for the baby than a purely artificial diet.

Contra-indications to Maternal Nursing.—The most important causes preventing a woman from nursing her child are the absence of milk from the breasts and the presence of tubercle. As is well known, phthisis is unfavourably influenced by pregnancy, and the same holds good in an even greater degree of lactation. When, therefore, there is the slightest suspicion of pulmonary mischief, even when there is only a marked hereditary tendency in that direction, and where the mother's weight is under the normal standard, or the chest narrow and ill-developed, the woman should be strictly prohibited from nursing. On the other hand, many women who are perfectly capable of fulfilling their maternal duties are unwilling (for social or other reasons) to undertake them. No effort should be spared to induce such persons to suckle their children, at least during the earlier weeks of life.

Wet-Nursing —Wet-nursing is undoubtedly the ideal substitute for maternal feeding when circumstances occur to prevent the latter. It is, however, in most cases impossible or inadvisable to engage a wet-nurse; the difficulty of getting a reliable woman, the expense entailed, and other reasons, usually render it desirable to put the child on artificial food. When a wet nurse has to be engaged it is well to see that she is neither too old nor too young—say, between twenty-two and thirty-two years of age; and that her own child is about the same age as the child to be nursed. The nurse should be well-developed and healthy, and her breasts firm and well-shaped. Both she and her child should be free from all symptoms of constitutional disease, and the general condition of the latter is usually the best testimony as to the quality of the milk; nevertheless, a microscopical and chemical examination may be made if desired. After she has begun to nurse the infant the chief points to be attended to are that her diet, though liberal, be plain; that alcohol be prohibited or strictly limited; and that fresh air and exercise be insisted upon.

ARTIFICIAL FEEDING.

When a child requires to be fed artificially the food most generally employed is cow's milk. Indeed, it is only in exceptional instances that any other diet is to be advised. It is true that the milk of some other animals more closely resembles that of the woman, but the difficulty of procuring these far outweighs any slight advantages they may possess.

It is popularly believed that it is wise to use the milk of a single cow; this is an erroneous idea, for, provided that the animals are healthy, fed on natural food, and not (as is too often the case near towns) largely on brewers' grains, the milk got from a dairy will vary less in composition than that got from a single cow.

Composition of Cow's Milk.—Cow's milk has approximately the following composition :—

Proteids,	3·75 to 4·00	per cent.
Fats,	3·50 to 3·75	,,
Sugar,	4·50	,,
Salts,	·70	,,
Water,	87·05 to 87·55	,,

The reaction should never be more than slightly acid ; it may, when the milk is but recently drawn, be neutral. Owing to the larger quantity of calcium phosphate combined with casein, the colour is much whiter than that of human milk ; the chief point in which the two disagree is, however, in the proteids which they contain. In the milk of the cow they are present in from two to three times the amount which exists in human milk. Further, while we have seen that in the latter the ratio of casein to lactalbumin is as 1 : 2, in the former the insoluble casein is four times as abundant as the soluble lactalbumin. This is the important distinction, and hence it follows that cow's milk is more completely coagulated by acids, and forms larger and denser curds in the stomach. As regards the proportion of fat which the two secretions contain they are of about equal nutritive value ; the fat globules of cow's milk are, however, somewhat small. The carbohydrates, though in the form of lactose, are here in less abundance, while the inorganic salts are present in about three times the quantity. In cow's milk as found in the market, even if freshly drawn, there are many bacteria ; human milk, as we have seen, is to all intents and purposes sterile.

Cow's Milk as a Diet for Infancy.—From the very considerable deviation of cow's milk from the natural food of an infant, especially with regard to the peculiarity of proteid constituents, it is necessary to modify it before it is fit for use in the diet of the average infant. The easiest and commonest method of doing this is by diluting it with twice its bulk of water. This will bring the proteids down to, or a little lower than, what is present in human milk, and, owing to the tendency of cow's milk to coagulate in firm masses, it is always well to have the percentage of proteids on the low rather than on the high side. The inorganic salts as a whole will be reduced to about the normal proportion, but the chlorides will be relatively deficient ; it is, therefore, advisable to add a pinch of salt to the mixture. But the dilution with two parts of water will have reduced the proportion of fats, and to a greater degree (though with less important consequences) of the carbohydrates, far below the standard required. To compensate for this we add a little cream, and sugar to the extent of 5 per cent. For the latter purpose lactose is often recommended by physicians ; it is the form of sugar present both in the milk of the woman and in that of the cow, and, therefore, seems the most appropriate form of carbohydrate to employ. Cane-sugar is, however, very frequently substituted, largely on account of its cheapness; some authorities, too, are strongly of opinion that it is better than lactose, in that it has less tendency to decompose in the intestinal tract.

As cow's milk is somewhat acid a pinch of soda is added to each bottle—about a grain to the ounce is sufficient. Lime-water may be employed for the same purpose, but as the proportion of calcium salts is already considerable, the bicarbonate of soda is, on the whole, preferable. The addition of alkalies has the further advantage of rendering the curd produced in the stomach less firm and dense.

In some cases dilution of the cow's milk, as above described, is all that is needed to render it a suitable food. Usually, however, and in towns invariably, where a considerable interval must elapse from the time of milking to the time when the milk is used, it is advisable to boil it so as to destroy the organisms which are present. The sterilisation of milk, its advantages and drawbacks, will be dealt with more fully later.

To sum up the above: the most generally useful artificial food is a mixture of boiled cow's milk and water, in the proportion of one of the former to two of the latter, rendered alkaline by the addition of a pinch of soda. To this we add about 3 per cent. of cream, 5 per cent. of sugar, and a small pinch of salt.

Rules for Artificial Feeding.—The best form of bottle to use is one of cylindrical shape without curves and without irregularities on the inner surface; the mouth must be sufficiently wide to admit of easy cleansing. Bottles with tubes should always be avoided, as it is absolutely impossible thoroughly to purify them. The nipple, which ought to fit directly on to the mouth of the bottle, should be of soft rubber and easily capable of being turned inside out so that it may be thoroughly scrubbed after each feeding. On every occasion on which it is used the bottle should previously have been washed with hot water and soda, using a bottle brush for the purpose; to have had it boiled is an additional safe-guard. It will, therefore, be found advisable to have at least two bottles and to employ them alternately.

The contents of the bottle should never be re-heated for use a second time. When the infant is getting a meal the bottle should be held for it so that there may be no swallowing of air, an occurrence which is not infrequent and which gives rise to great discomfort and fretfulness. To allow the child to fall asleep with the teat in its mouth is to cultivate a habit which had better be avoided.

In regard to the frequency with which the infant should be fed, and the quantity to be given at a meal, the size of the stomach and the number of meals required by a breast-fed baby must be borne in mind. The following table shows at a glance the size and frequency of the bottles at different ages:—

Age.	Feedings in Twenty-four Hours.	Intervals between Meals during Day.	Number of Night Feedings, 10 p.m. to 7 a.m.	Quantity.	
				At each Meal.	In Twenty-four Hours.
		hrs.		ozs.	ozs.
3rd to 7th day, . .	10	2	2	1 to 1½	10 to 15
2nd to 3rd week, . .	10	2	2	1½ ,, 3	15 ,, 30
4th to 5th week, . .	9	2	1	2½ ,, 3½	22 ,, 32
6th week to 3rd month, .	8	2½	1	3 ,, 4½	24 ,, 36
3rd to 5th month. , .	7	3	1	4 ,, 5½	28 ,, 38
5th to 9th month, . .	6	3	0	5½ ,, 7	33 ,, 42
9th to 12th month, . .	5	3½	0	7½ ,, 9	37 ,, 45

(*Holt.*)

As time goes on, with increase in the digestive power, the dilution of the milk is correspondingly diminished, until by the eighth month pure milk is given. The following table shows the strength of the mixture at different periods:—

Age.	Cream.	Milk.	Water.	Sugar.	Salt.	Total Quantity.
To 6th week, .	2 drs.	½ oz.	1 oz.	20 grs.	a pinch	17 ozs.
6th to 8th week,	½ oz.	10 drs.	10 drs.	30 ,,	,,	30 ,,
3rd to 6th mth.,	½ ,,	2½ ozs.	1 oz.	60 ,,	,,	32 ,,
6th to 7th mth.,	½ ,,	2½ ,,	1 ,,	60 ,,	,,	36 ,,

(*Louis Starr.*)

During the first week or two of life it is often advisable, especially in weakly infants, to dilute the milk with more than twice its bulk of water, since, as we have seen, the proteid of cow's milk is less digestible than that of human milk.

Instead of using water as a diluent, barley-water is frequently employed. Since neither the salivary glands (the parotid excepted), nor the pancreas as yet possess the power of converting starch into sugar, the nutritive value of the barley-water is but trivial; its value is due to the increased digestibility of the proteids which it brings about by a mechanical subdivision of the curd. It also follows that, as excess of starch is not only useless but even detrimental to the infant, the barley-water should be weak.* When a tendency to constipation exists oatmeal gruel may be substituted. Rice-water and weak solutions of gelatin are sometimes employed for a similar reason. When a more distinctly purgative action is wished fluid magnesia is a suitable diluent ; to check diarrhœa, lime-water is commonly added to the bottle.

It will be found that most infants thrive well on cow's milk diluted as above described. But, as might be expected, there are individual peculiarities which at times require special modifications of the food used. The points on which we rely in deciding whether alteration of the diet is needed, are the general appearance of the child, whether or not it is gaining weight, and whether it has a healthy colour or is pale and flabby. When the progress does not seem all that is to be desired, some indication of the lines on which the food needs modification may be gained by an examination of the stools.

When sugar is in excess the motions are apt to become green, loose, and frequent, and to lead to irritation about the buttocks. The child is uneasy, suffers from colicy pains, eructations of wind, and sometimes regurgitation of food. If the sugar be deficient, the bowels are often constipated, and the gain in weight is slow. Excess of fat gives rise to simple diarrhœa with the appearance of fat in the stools, and often to regurgitation of food. If it be insufficient, constipation usually results. If the diet contain too much proteid, curds appear in the stools ; there is usually constipation, but sometimes diarrhœa occurs ; colic is frequent, and occasionally there is vomiting.

If cow's milk, even when diluted with thrice its bulk of water, disagree with the child, Biedert's cream mixture may be tried, and in many cases it answers its purpose very well. It is made by mixing 4 ounces of cream with 12 ounces of warm water, and dissolving in the mixture ½ ounce of milk-sugar ; as the child grows older some milk is added.

Very similar to the above is Meigs's mixture, which is at times of value. It consists of :—Cream, 1 oz. ; milk, ½ oz. ; 11 per cent. solution of milk-sugar, 1½ ozs. ; lime-water, 1 oz.

Various other modifications of these mixtures have been suggested.

Sterilised and Pasteurised Milk.—As it is delivered to the consumer, milk contains a very large number of bacteria which are apt to give rise to pathological changes in the intestinal canal. The chief organisms found are the various saprophytic germs which produce infantile diarrhœa (the bacillus of green diarrhœa, &c.), the bacillus of tubercle, the bacillus coli communis, and the organisms of scarlet fever, typhoid, diphtheria, cholera infantum, and the like. The usual method of treating the milk is simply to boil it for from fifteen to thirty minutes, but, as it is often inconvenient for the mother to do this before every feeding, various forms of apparatus have been introduced whose object it is to sterilise at one time sufficient milk for the whole twenty-four hours or longer. It must be understood that "sterilisation," as applied to milk to be used for an infant's food, is a somewhat loosely employed term. By the methods adopted, although all the ordinary organisms are killed, their spores are not destroyed, so that the milk will only keep fresh for a day or two and cannot be preserved for an indefinite period.

---

* **To make Barley Water.**—Boil two teaspoonfuls of pearl-barley in an open saucepan with a pint of water till the quantity is reduced by about a third ; then strain. Before boiling, it is better to soak the barley in cold water for an hour or two, so as to cleanse it and remove part of the starch : this water is, of course, thrown away. Water-gruel and rice-water may be made in the same way.

Of the various patterns of sterilising apparatus which have been introduced, that of Soxhlet (1) is one of the earliest and best known. Cathcart (2) has invented a very convenient and inexpensive form.

(1) **Soxhlet's Milk Steriliser** consists of a large oval vessel or kettle containing a rack with spaces for six or eight bottles. Each bottle has a capacity of about half-a-pint, and is closed by a rubber stopper perforated by a hole into which a smaller glass rod or stopper fits. Special teats are supplied for use with the bottles. The milk to he sterilised is diluted to the required extent, and poured into the bottles to within half an inch of the neck; the india-rubber stoppers are then pressed firmly in the mouths of the bottles. The latter are then placed in the bottle frame, and the whole is deposited in the kettle, which is filled with cold water to the same level as that of the milk contained in the bottles. It is then placed on the fire and allowed to boil. After it has boiled for five minutes the bottles are completely closed by the insertion of the glass rods or stoppers (previously dipped in boiling water so as to render them sterile), and the water is allowed to remain at the boiling point for three-quarters of an hour, after which the bottles of milk may be taken out and allowed to cool. When the child is to he fed one of the charged bottles is placed in a metal jar filled with cold or lukewarm water, and heated until it reaches the required temperature. The glass stopper is then withdrawn, and the rubber teat slipped over the mouth of the bottle. A bottle which has been partially used, or has been opened from any cause, must not, on any account, be given to the child.

(2) **Cathcart's Milk Steriliser.**—The apparatus consists of a tin vessel of about 60 oz. capacity, furnished with a nickel-plated draw-off cock. The lid, which fits on to an inner rim, is flush with the outer surface, and is provided with a small funnel in the centre. To prevent the cream from accumulating on the top there is a stirring apparatus, consisting of a rectangular piece of metal bent so as to resemble a screw propeller, with a handle which projects through the funnel in the lid far enough to be rotated by the forefinger and thumb. The apparatus fits easily into a No. 7 pot or sauce-pan, which size of pan will be found in almost every house.

Directions for Use.—Remove the upper band and lid; rinse out the vessel with boiling water, then pour in the quantity of milk or milk food required for twenty-four hours. Place the vessel in the pot, which should be about a quarter full of boiling water, and allow it to remain over the fire for fifteen minutes, during which time the milk should be occasionally stirred. Then remove the vessel from the pot, spring the rubber band over the lid where it joins the vessel, and place a loose plug of cotton-wool in the top of the funnel round the handle of the stirrer. Keep the vessel containing the now sterilised food in a cool place, and draw off into the feeding bottle from the stop-cock as required, having previously stirred the contents of the vessel by rotating the projecting rod.

When peptonised milk is used the apparatus may be used in a similar way, except that the peptonising is allowed to continue at a gentle heat before being stopped by placing the steriliser in the pot of boiling water.

But there are some objections to the use of sterilised milk: its taste becomes bitter, some of the sugar is converted into caramel and gives a light brown colour to the milk, the lactalbumin loses its solubility and becomes less susceptible of the action of pepsin and pancreatic juice, the fat globules too become less digestible, they coalesce and form larger masses than normal. Perhaps more important than all these is the fact that sterilised milk loses some part of the antiscorbutic quality it possesses, and that scurvy has been known to result from its prolonged use.

These changes are believed to occur when the temperature reaches about 180° F.; the higher the temperature and the longer it is maintained, the more marked do they become. It has, therefore, been suggested that sterilisation should be replaced by pasteurisation —that is, that the milk should not be heated above 160° to 170° F. Such a temperature destroys or arrests the growth of most of the organisms present, and enables the milk to be preserved for a day or two. The taste is not much altered, and the digestibility does not seem impaired. It is, perhaps, questionable whether the antiscorbutic property of the milk remains entirely unaffected.

The only difficulty in carrying out pasteurisation is that the process requires some care and attention in order that the requisite temperature may not be exceeded. The apparatus needed is a suitable sterilising kettle, through the lid of which a thermometer can be inserted. The milk, diluted and modified as desired, is placed in bottles in a bottle rack or in a single larger vessel. After plugging the bottles with cotton wool (or in the case of a jar covering with a closely fitting lid) they are put in the kettle, which is filled with water up to the level of the milk contained in the vessels. The whole is then placed over a lamp or gas stove and heated until the thermometer (whose bulb dips into the water, not into the milk) registers 171° F. The kettle is then removed, placed upon a non-conducting substance, such as a board covered with a few layers of flannel or a sheet of wadding, and covered with a thick closely fitting cosy. "The thermometer should mark a temperature of between 167° and 170° F. for thirty minutes, at the expiration of which time the tubes [of milk] are to be removed from the steriliser, and are to be kept in a cool place, preferably the ice chest, until needed" (*Rotch*).

Peptonised Milk.—In many cases the milk given to the child may, with advantage, be predigested: this is usually done by the addition of pancreatic extract and bicarbonate of soda. For practical purposes one of the readiest means at our command is the use of Fairchild's zyminising powders. Each of these is capable of peptonising 1 pint of milk, and, as it is best to dilute to the desired extent before peptonisation, a quantity of the powder corresponding not to the amount of the mixture, but to the actual proportion of milk present, should be used. The diluted milk with the powder is put in a jar standing in a pot of water at such a temperature as the hand can just bear for a moment or so (150° F.); it is allowed to remain for from five minutes to half an hour, according to the degree of peptonisation wished. The longer the temperature is maintained the more of the proteid is converted into peptone, and, consequently, the more bitter does the taste of the milk become. After the requisite time has elapsed, the milk is either heated to boiling point for a minute, so as to effectually prevent any further action of the ferment, or it may be placed on ice, a proceeding which temporarily arrests the digestive action. Instead of Fairchild's powders, Benger's liquor pancreaticus, Armour's pancreatic tabloids, or some other preparation of pancreatic extract may be used, always provided that bicarbonate of soda is present. Peptonised milk will be found of greatest value when from any cause the power of digesting casein is very defective. Its use should never be continued longer than is absolutely necessary, lest through functional disuse the digestive power of the peptic glands become still further impaired. The duration of the peptonisation should, therefore, be from time to time shortened until at length undigested milk is given.

Humanised Milk. — Although somewhat indefinitely used, this term is generally applied to cow's milk which, by the removal of a considerable proportion of its proteid, is brought to resemble human milk in composition. It was originally devised by Frankland, and is prepared in the following manner:—Allow one-third of a pint of milk to stand for twelve hours; remove the cream and add it to two-thirds of a pint of fresh milk. Take the milk from which the cream has been removed, add a piece of rennet (or a good liquid extract of rennet), and let it stand in a warm place till it is curdled —a process which occurs in a few minutes; beat up the curd into small pieces, strain, and add the whey to the milk into which the cream has been put. This is the method as suggested by Frankland. It is usually, however, preferable to remove still more proteid; accordingly, instead of one-third and two-thirds of a pint, we prefer to divide the milk into equal parts, to one of which is added the cream and whey yielded by the other.

Condensed Milk.—This is made by heating milk to the boiling point, evaporating *in vacuo* to about a quarter of the original bulk, and (usually) adding a considerable quantity of cane-sugar—about 6 ounces to the pint. The preparation is then preserved in hermetically sealed tins. To some brands of condensed milk no sugar has been added, these are known as "unsweetened." Before use as an infant's food it is, of course, necessary to dilute the milk; a mixture in the proportion of one in twelve or fourteen is generally employed. One great drawback to the use of such a mixture is the small quantity of fat contained in it. This is shown in the following table.

A further disadvantage is the absence of the antiscorbutic element. These deficiencies are in no way compensated for by the excess of sugar, for, though children fed on tinned milk rapidly become fat, and often show no symptoms of gastro-intestinal disturbance, they are nearly always flabby and do not resist disease well; while if its use has been long maintained, symptoms of rickets (and perhaps

	Condensed Milk.	With 6 parts of water.	With 12 parts of water.	With 18 parts of Water.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Proteid,	8·43	1·20	·65	·44
Fat,	6·94	·99	·53	·36
Sugar { Milk 10·25 Cane 40·44 }	50·69	7·23	3·90	2·67
Salts,	1·39	·17	·10	·07
Water,	31·30	90·49	94·82	96·46

(*Holt.*)

scurvy) will usually be found. Condensed milk is, however, largely used by the laity, and especially by the poorer classes, and, with certain limitations, has its advantages. It is sterile, when properly diluted its proteid is digestible, it can always be obtained even where good cow's milk cannot be procured. In employing it, then, we must look upon it, first, as only suited for temporary use ; and, secondly, as requiring modification in those respects in which it is deficient ; a little cream should always be added ; and sometimes a readily digested proteid, such as a few drops of meat juice or some egg albumin, is also required.

Whey.—Whey is valuable in some forms of derangement of the gastro-intestinal tract. It is prepared as described in dealing with the subject of humanised milk. As lactalbumin is absorbed from the gastro-intestinal tract, it is, as a rule, neither necessary nor desirable to remove it from the whey by boiling.

White Wine Whey.—This also is a serviceable preparation in the treatment of some diseases. To make it :—Place a pint of milk in an enamelled saucepan, heat, and when it boils add two wine-glassfuls of pale sherry, boil again for a couple of minutes. A curd will form from which the whey must be strained. A little sugar is usually added.

Infants' Foods.—The number of these on the market is legion. They differ greatly in composition. Some (the worst) consist largely of unchanged starch granules ; others of wheat or barley flour completely dextrinised ; others again are composed of sweetened condensed milk, to which are added partly dextrinised farinaceous substances ; a fourth group contains proteids more or less peptonised, and in some cases additional fat. The malted foods contain dextrine and maltose with, in some instances, cane-sugar.

We do not here intend to speak of these artificial foods in any detail, because, although some of them may occasionally for a short time be of service, they should not be regularly used in early infancy. Merely diluted with water they are insufficient in nearly every respect ; when diluted with milk and water they are unnecessary, and often injurious. When diluted in the proportions recommended on the bottle, nearly all contain too little proteid, and that little in a vegetable form much less digestible than the animal proteid of milk. The proportion of fat is always far too low—a serious defect in the food of an infant. In many of them the carbohydrates occur chiefly in the form of unaltered starch, with which the digestive apparatus is at this time unable in any appreciable degree to deal; fermentative changes are thus apt to arise, and the products of these may very readily lead to gastro-intestinal disturbances. There is, probably, no more certain means of producing rickets than by giving one of these foods diluted with water only, or with too little milk added; further, most cases of infantile scurvy occur in children, often of well-to-do parents, who have been reared on infants' foods.[*]

Raw Meat Juice.—This is a most valuable dietetic adjunct in certain diseases. It is made by cutting good rump steak into small pieces free from fat, adding a fourth of its bulk of water and a little salt, allowing it to stand for half an hour in a cool place, and then straining under pressure. It readily decomposes and so must be freshly prepared on each occasion upon which it is used. It contains a considerable quantity of soluble albumin, with some nitrogenous extractives, and has been shown to be highly anti-scorbutic.

Egg-albumin and Water.—This is made in the following manner:—The white of one egg is added to a tumblerful of cold water, and thoroughly stirred until it is broken up. A little sugar is added in order that the infant may take it more readily. As it contains only albumin and water (the sugar may be practically disregarded), its chief value is in the treatment of certain cases of diarrhœa where a tendency to the decomposition of starch and fat exists.

II. FEEDING IN LATER INFANCY AND CHILDHOOD.

When, after the tenth or eleventh month of life, the amylolytic function has become pretty fully developed, much of the carbohydrate required may be given in the form of starch. For such a purpose we may at first use "flourball,"[†] or some preparation of oats or barley, either made into gruel or barley-water, or in the more concentrated form of oat or barley jelly. Because they contain more fat, oats are more nutritious than barley; they are also less digestible, because their starch is less readily convertible into sugar.

Towards the end of the first year, beef-tea, beef-juice, and yolk of egg may, with advantage, be added to the diet. From the twelfth to the twentieth month there should be five meals a day, and these should consist of milk, bread and milk, oat and barley gruel, rice, beef-tea, mutton broth free from fat, chicken soup, and (towards the end of the period) eggs and baked potatoes. Subsequently, we may give a little brown gravy, butter, &c. Of fruits, baked apple and orange juice are among the earliest permitted.

---

[*] It will be understood that these remarks apply to artificial foods as substitutes for milk. Although out of place for this purpose, they form a convenient and palatable addition to the diet of older children.

[†] **To make Flourball**:—"Take one pound of wheat flour, tie it up in a pudding-cloth, place in a saucepan, and boil for ten hours. When cold, the soft outer covering is cut away, and the interior grated into a powder. When it is to be used, a teaspoonful of the flour is rubbed up into a smooth paste with a tablespoonful of milk, some more cold milk is added, and the mixture is stirred until a cream is formed. A quarter of a pint of hot milk, or milk and water, is poured over it, and when well mixed the food is ready for use."

After the eruption of all the milk teeth, the meals should, as a rule, be reduced to four in the day, and fruits and fresh vegetables be added to the diet. Milk should remain the staple, and meat should be given very gradually, and ought not to be used regularly until about the end of the third year. Sweets should be used in moderation, tea and coffee are better replaced by cocoa, and eating between meals should be forbidden. It must not be forgotten that a child is often thirsty, and should, consequently, have an opportunity of taking a drink of cold water when it so wishes.

CHAPTER IV.

GENERAL THERAPEUTICS.

Contents.—Diet—Feeding—Dress—Bathing—Massage—Electricity—Attention to the Bowels—Rectal Injections—Poultices—Counter-irritants—Depletion—Cleansing of the Mouth and Nose—Bronchitis-tents — **Medication by Drugs** — Dosage — Antipyretics — Stimulants—Hypnotics—External Applications in Skin Diseases—Posological Table.

Diet.—During the period of infancy the diet of a sick child is very much the same as in health, consisting mainly of milk diluted or modified as required. In the treatment of gastro-intestinal disorders the dietetic treatment is of the greatest importance, and is described in the section dealing with these diseases. On one point some stress may be laid. The adult distinguishes between hunger and thirst, but to the child milk is both food and drink, and we must not suppose that whenever he cries the patient is hungry. It is therefore desirable in many forms of disease—particularly in fevers, digestive disturbances attended with diarrhœa, and conditions where there is a constant drain upon the tissue juices—to allow a considerable amount of cold water. Indeed, in many forms of gastro-enteritis all food may sometimes be advantageously replaced by water for a period of twelve or twenty-four hours.

Feeding.—When for any reason—breathlessness, feebleness, or paralysis of the muscles of deglutition—there is difficulty in administering nourishment in the ordinary way, we have recourse either to the use of the stomach tube or rectal feeding. The former is very often satisfactory, especially in comatose or semi-comatose infants. A No. 10 or 12 red rubber catheter is passed along the floor of the nose a little way into the gullet. The food—peptonised milk, brandy, beef-tea, &c.—is poured down it by means of a funnel. In these cases it is well to add to the food any medicine that is being given, and thus, as much as possible, avoid disturbing the patient. If a nutrient enema be preferred, the amount should not exceed about half an ounce for an infant, and the injection may consist of peptonised milk or beef-tea, &c., and may be repeated every three or four hours. Nutrient enemata are not usually tolerated for more than a day or two.

Dress.—The dress of the sick child needs no special mention. The night-gown should be of soft flannel, and must be changed frequently on account of the perspiration. The temperature of the sick room should not exceed 60° F. save in respiratory affections, when it may with advantage be kept at about 65° or 70°. But in some cases of premature and feeble infants the high temperature of the incubator is needed if life is to be preserved. Failing this, we place the child in a cot near to the fire, and surround it with a screen.

Bathing.—Apart from the ordinary purposes of cleansing, bathing has many therapeutic uses. Hot and warm baths are valuable stimulants in cases where the body temperature is low and signs of collapse are developing. They may be rendered more stimulating by the addition of ½ oz. of mustard to the gallon, the child being held in the bath until its skin is becoming red and the nurse's arms are beginning to smart. Warm baths are also useful in all forms of convulsions, as sedatives in chorea and nervousness generally, and in exciting the action of the skin in Bright's disease. Cold bathing must be somewhat cautiously employed in infancy. In older children—those over five—it may be used more freely. The bath may either be of water at a temperature of 60° to 70° F., or it may at first be warmer and then gradually cooled down. In any case the child must not be left too long in the bath, and should be well rubbed on coming out. The chief objects of cold bathing are the reduction of the temperature and the stimulation of the respiratory centre. In the former, the bath is used as in the adult, the patient being put in water of a temperature of 98° to 100° F., and the bath cooled down by adding cold water or pieces of ice; collapse must be guarded against by stimulants. A cold douche to the head while the child sits in a warm bath is of great use in hyperpyrexia with head symptoms, in convulsions with feverishness, &c. Cold bathing exerts a marked stimulus on the respiratory centre, but is seldom used for this purpose, the risk of collapse being too great. Baths may often be advantageously replaced by the **pack**. This is applied by wringing a sheet out of cold or warm water, rolling it round the patient, and wrapping in a blanket. This is often preferable to immersing the body in a bath, the patient is less disturbed and the shock is less. The objects of the hot and cold packs are the same as those of baths; the amount of diaphoresis excited is, however, greater. Similar results may be attained by **sponging.**

Tepid sponging of the arms and legs is often attended by a marked diminution in temperature and necessitates little exposure. In other circumstances **local packs** are of value. In bronchitis and broncho-pneumonia, where there are signs that the respiratory muscles are becoming weakened and the bronchi plugged, the wrapping up of the chest for from three to five minutes in a piece of flannel wrung out of cold water, will often cause deep inspiration and at the same time act as an antipyretic. In cases of chronic peritonitis a piece of moist boric lint applied like a fomentation, covered with mackintosh and renewed every six or eight hours, is often beneficial. Its use must be protracted over a considerable period, when a slight rubefacient action is set up, with beneficial effect on the peritonitic process.

Massage is very often useful in childhood; the indications for its use are the same as in the adult and need not detain us here. It is of particular service in atrophy of the muscles, whether of central origin or not, and also in cases where there is a tendency to contracture and deformity. It may also be of use in cases of chronic constipation.

Electricity.—The general indications for the use of galvanism and faradism are alike in the young and in the old. But one important use of faradism is not sufficiently put into practice in this country—this is its employment as a stimulus to the failing power of respiration. In some cases where the smaller bronchi become blocked by secretion the patient dies of carbonic acid poisoning, simply because he is too weak to cope with the resistance to the ingress of air. In these circumstances, when the cyanosis is deepening and the breathing becoming more and more shallow, judicious faradism of the thorax and diaphragm, sufficient to cause muscular contraction, will occasionally bring about surprising improvement in the condition of the patient, and, if repeated as occasion may require, may tide the child over the dangerous period until the secretion becomes more fluid and the swelling of the mucosa subsides.

Attention to the Bowels.—When the child is lying in bed, and on an exclusively milk diet, constipation is apt to occur. Should the nature of the case permit, we may combat this by adding a little solid food, such as porridge or stewed fruit; beef-tea and meat juice also act as laxatives, and, indeed, may need to be withdrawn from the diet for this reason. But when diet fails, it is well to give a purgative regularly. Among the most suitable for use in most cases of illness are mineral waters, fluid extract of cascara, freshly-made liquorice powder, and senna. Where constipation is marked, no drug is so generally useful as castor oil. In acute illnesses, when it is desirable to have the bowels moved at the commencement of the treatment, calomel is the drug we prefer. When watery motions are desired, as in Bright's disease, Henry's solution of sulphate of magnesia or compound jalap powder is the best purge. The latter is somewhat uncertain in its action. The common error made is to give aperients to children in too small doses. Thus a dessert-spoonful of castor oil or 3 grs. of calomel is not too much for a patient of 4 years; for a child a year old the doses may be one half.

In some cases enemata are preferable to purgatives. We may order a simple water enema when it is wished to empty the bowel with the least possible amount of irritation, a soap and water enema when something a little more active is required, or one containing castor oil when a distinctly purgative action is sought. About 1 oz. of oil should be used, and the quantity of a purgative enema for a child of five is from 6 to 10 ozs. or more.

Rectal Injections.—We may wish to introduce substances into the bowel for reasons other than that of producing an evacuation. Thus, in the treatment of oxyurides, injections of infusion of quassia or salt solution may be given. As it is desirable that these should be retained, and not immediately returned, it is well to empty the bowel previously by a purge or enema, and then, supporting the hips on a pillow so that the fluid may run into the colon, to inject 2 to 4 ozs. slowly through a syringe. In all cases where enemata are given with the object of being retained for some time, a fairly long nozzle should be used for injection, in order that the fluid may pass high up into the bowel.

Irrigation of the bowel with large quantities of fluid is highly praised in the treatment of colitis. It is not always easy to carry it out. The patient's hips are raised on a pillow, or in young infants the pelvis may be lifted by placing the patient on his back and supporting him gently by the feet. In other cases the patient may lie on his side. The fluid (15 to 30 ozs.) is placed in a douche can, raised about 2 feet above the level of the anus, and is allowed to flow into the rectum through a soft well-oiled catheter. At first, only the point of the instrument passes through the sphincter: as the rectum gradually distends the catheter is introduced farther into the bowel by a gentle rotatory movement, the object being to cause the fluid to run as high up as possible. In order to prevent the injection from being immediately returned it is sometimes necessary to encircle the catheter by a pad held firmly against the anus. The douche can should not be raised more than is necessary to maintain a steady flow through the tube. In colitis, bland non-irritating or slightly astringent and antiseptic fluids should be used.

Besides being used in colitis, irrigation of the bowel is of use in hastening the disappearance of catarrhal jaundice. For this purpose, water at as low a temperature as can be borne is employed. Large irrigations are also of value in the treatment of intussusception.

Lavage of the stomach is beneficial in certain gastric affections. A large-sized soft rubber catheter with a funnel should be used for this purpose.

Poultices.—The best substance of which to make a poultice is good linseed meal. Cheap linseed can be obtained: it has had all the oil removed, and does not keep hot for any considerable period.*

In poulticing a child one caution is needed. The poultice must never be very hot. It should be warm and soothing, and if a child cry much after a poultice has been applied we may be certain that it has been too hot. It is no uncommon thing to see sloughing of the skin produced by the use of almost boiling poultices. In diseases of the lungs we may employ poultices in two ways. (1) **The continuous jacket poultice.** In this case the whole chest is enveloped in a large linseed poultice which is changed regularly every four hours. This is useful when the patient is fairly robust, and in cases of diffuse bronchitis. It is usually, however, preferable to poultice only the back, or, at most, to put very small light poultices on the front and sides of the chest. The movements of respiration are thereby less embarrassed, and the region where the lungs are most accessible is reached. (2) **Intermittent poulticing.** This is of very great service in the patchy bronchopneumonias of young and weakly children. We direct that a small linseed and mustard poultice be applied over the affected area, and that it be only kept on long enough—from 20 to 30 minutes—to redden the skin.

Bread poultices, oatmeal poultices, &c., are often used by the poorer classes. They are not so good as those of linseed.

In all skin affections with crusting, the first thing to be done is to get rid of the scabs. This is best done by starch poultices,† to which boric acid may be added in the proportion of a teaspoonful to the half pint.

Counter-irritants are of service in the same conditions as in adults. The use of mustard poultices and the mild counter-irritation produced by the wet pack have been alluded to. Among gentle rubefacients suitable for children the linimentum terebinthinæ and the linimentum ammoniæ are useful. Tincture of iodine may be applied; if not sufficiently strong alone, an equal part of the liniment may be added. In chronic bronchitis croton liniment is an invaluable application. Its action is, however, uncertain; it should at first be diluted with an equal quantity of olive oil and painted (not rubbed) on the chest with a small brush. Mustard leaves form a convenient, if somewhat painful, counter-irritant. Blisters must be used with caution. They should never be applied to children below the age of three or four, and in weakly patients may cause a slough. Small flying blisters are best; they need not remain on for more than an hour or two, when, if vesication be not produced, a light poultice may be applied. Thus used, they are of great value in chronic bronchopneumonia, pericarditis, refractory forms of arthritis, &c.

---

* **To make a Poultice**:—Thoroughly warm a bowl, either by heating in an oven or placing in boiling water; place the linseed meal in it and pour on boiling water, beating with a table knife to a thick paste. Spread on linen to within an inch of the margin, dipping the knife in hot water occasionally while so doing in order to prevent sticking. Fold the edges of the linen over the poultice, and apply it covered with a piece of mackintosh and a few thicknesses of flannel. If a mustard poultice be desired, add one or two teaspoonfuls of dry mustard while stirring

† **To Make a Starch Poultice**.—Mix a tablespoonful of starch with sufficient cold water to make a thick cream. Pour boiling water over it until an opalescent solution results. Add a drachm of boric acid and stir. When cold, a paste forms which is spread upon a piece of linen and applied to the part. Starch poultices should be renewed every six hours.

Depletion.—As children do not stand loss of blood well, bleeding is seldom desirable. Leeches * may be applied where local depletion is required, as in acute mastoid inflammation and pericarditis. The bites may be allowed to bleed after the leech falls off, or even stimulated by applying heated test-tubes to act as dry cups. Usually, however, the amount drawn by three or four leeches is sufficient, and the bites should at once be touched with lunar caustic—the most effectual means of stopping the bleeding. It is important to attend to this point, as, owing to the presence in the bites of a substance which prevents the coagulation of the blood, hæmorrhage goes on for a long time after the leech has been removed, and may even prove dangerous.

Wet cupping is rarely required, but dry cups are very useful in the dyspnœa of congestion of the lungs from heart failure. The occasion for them arises less frequently in children than in adults.

Cleansing of the Mouth and Nose.—The mouth of the sick child requires the most scrupulous attention. It should be cleansed frequently with a soft rag moistened in boric lotion or solution of borax. Young children cannot gargle; applications are therefore made to the throat by syringing, by painting, or by the vaporiser. A generally useful pigment for the throat consists of equal parts of boroglyceride and glycerine. In chronic pharyngitis we may prescribe: iodi, 5 grs.; potass. iodidi, 10 grs.; glycerin. 1 oz. As a douche, a 1 per cent. solution of bicarbonate of soda may be used.

Bronchitis Tents.—The ordinary bronchitis tent and kettle are of great use in cases of acute pulmonary affections. We must beware of putting the kettle within reach of the child, lest it be overthrown, or the patient burned by the steam. Substitutes for the special kettle and tent can easily be improvised by means of a roll of paper, an ordinary kettle and spirit lamp, a clothes' screen, and a sheet. If the room be small, the steam of a kettle boiling on the fire may be sufficient to keep the air moist. What is safer, and in most respects as efficacious as the kettle and tent, is the use of water vapour saturated with eucalyptus. To this end a tent is made to cover in the whole of the bed, its sides being formed by curtains which can be raised at will. From the framework towels wrung out of boiling water and then sprinkled with oil of eucalyptus are hung.

---

* **To Apply Leeches.**—Place the leech in a test-tube with the head (the thin end) nearer to the mouth of the tube. The skin must be thoroughly cleansed, first with soap, then with plenty of pure water. It is then smeared with milk and the test-tube containing the leech applied. The animal should be allowed to remain on until it falls off spontaneously.

About a tablespoonful of eucalyptus is put on each of them, and they must be changed every four hours. The disadvantages of this method are that the patient gets less fresh air than in the ordinary tent (in many cases a serious objection), and that the eucalyptus becomes somewhat expensive. Against these drawbacks must be placed the greater convenience and safety of the method.

MEDICATION BY DRUGS.

The medicinal treatment of the child does not differ in many points from that of the adult. We usually administer drugs by the mouth in the form of a liquid or a powder. Pills should be avoided. It is convenient to make up mixtures to 1½ ozs., and to order teaspoonful doses. Except in quite young infants the taste of nauseous substances should be concealed in some way; the syrups of orange, lemon, or ginger, and the fluid extract of liquorice may be used. As sugar is apt to give rise to fermentation it is inadvisable to prescribe these syrups too freely; glycerine may be substituted when a simple sweetening agent is desired, and in some instances glycerides, the glyceride of the iodide of iron for example, are preferable to the compound syrups of the pharmacopœia. Powders should not be bulky, but neither should they be too small. In giving a very small dose of an active remedy in this form it is well to make the dose up to three or four grs. by adding some inert drug.

As a rule it is sufficient to give medicines three or four times daily; it is undesirable to waken the patient at night to give a dose.

Dosage.—The dose may be calculated as $\frac{\text{age of child}}{\text{age of child} + 12}$. Thus in a child of 3 years the equivalent of an adult dose of 15 grs. would be $\frac{3}{3 + 12}$ or $\frac{3}{15}$ or 3 grs.

Certain remedies, however, are not governed by this rule. Thus opium requires to be used extremely cautiously, but is of such value that infants must not be deprived of its benefits if occasion demand its use. Quinine, and sometimes strychnine, are (as a rule) the only alkaloids given to children; it is better to replace the others by less active preparations. Children are also unduly sensitive to the action of iodoform, carbolic acid, and chlorate of potash. It is undesirable to administer more of the last named than about 20 to 30 grs. per diem, and care should be taken that solutions used for gargling are not actually swallowed.

But a far larger number of drugs are well borne by children and can be used in quantities equal to, if not exceeding, the adult dose. Arsenic, mercury, belladonna, quinine, chloral, the bromides, bismuth, &c., come under this head.

The most generally useful drugs are given in the posological table appended; it only remains to say a word or two about antipyretics, stimulants, and hypnotics.

Antipyretics are often called for. The value of tepid sponging has been alluded to, but in many cases drugs must be employed. Quinine is the most reliable; next we would place antipyrin and phenacetin, and in rheumatic cases salicin and its compounds. Digitalis is not of much avail as an antipyretic in childhood. In many cases alcohol has a beneficial action in this respect, and may be combined with quinine and antipyrin. On account of the depression which it causes, antifebrin should not be used, and for the same reason the external application of guaiacol is unsafe.

Stimulants.—No rule can be laid down for the use of these, save that they are to be given as the state of the pulse demands. But sometimes when a child is convalescing from an acute illness in which alcohol has been given, it is noticed that after a temporary improvement its temperature keeps up and its tongue remains dry, that it is fretful, drowsy, and perhaps vomits, though locally all is going well. In such cases it may happen that the alcohol is being continued in doses which are now excessive, and when it is withdrawn all the bad symptoms disappear. Speaking generally, to a a child of two years we give 1 dr. of whisky where we should give ½ ounce to an adult; to a child of one year, half that amount. Brandy or whisky should be given diluted with a little water or milk, and followed by some food, but it is of no use to put twenty drops of spirits into a feeding bottle of milk and then suppose that the child is being stimulated freely. Port is very useful in some convalescent patients. Of other stimulants, digitalis, camphor, and strychnine, are the best. In chest cases, sal volatile and the compound spirit of ether are the most useful.

Hypnotics.—The bromides, chloral, and tincture of lupulus are the most satisfactory hypnotics. They should be given just after the patient is settled for the night, and may well be followed by a drink of warm milk. Paraldehyde often cannot be swallowed on account of its taste. Chloralamide, sulphonal, and trional may occasionally be useful.

External Applications in Skin Diseases.—In cases where crusting has occurred, as in ordinary impetiginous eczema, the first thing to do is to remove the crusts by starch poultices. We may then apply white precipitate or citrine ointment diluted with oxide of zinc. The following prescription is suitable for the majority of cases:—℞. ung. hydrarg. ammon. 1 to 3 drs., ung. zinci oxid. 1 oz. Indeed, in many severe cases, starch poulticing and cleanliness, with the application of equal parts of lanolin and zinc ointment, is sufficient to bring about a cure. Another useful application where the crusting is less marked is the unguentum vaselini plumbicum—a mixture of equal parts of lead plaster and vaseline. In more chronic cases we may employ tar, but must use it cautiously until we see how it is tolerated. Thus we may prescribe 5 to 15 drops of liquor carbonis detergens in an ounce of zinc or weak mercurial ointment, or order a lotion containing 20 drops of the liquor in 8 ounces of water, to which a few minims of liquor plumbi subacetatis may be added. In obstinate cases of eczema capitis great benefit may follow painting the scalp with a solution of nitrate of silver (10 grs. to 1 oz.). For intertrigo the following dusting powder may be used:—℞. acid. salicyl. ½ dr., pulv. zinc. oxid. 2 drs., pulv. amyli 6 drs. Many others are of equal value. In all cases of eczema and intertrigo the use of ordinary soap should be discouraged, and instead a superfatty soap used. Or we may order that the child be washed in water containing a handful of oatmeal to the gallon.

Scabies may be treated by a sulphur, or a tar and sulphur ointment. We generally tell the mother to wash the affected parts thoroughly with soap and warm water, and then to apply the ointment thickly. This is to be done on three consecutive nights and then stopped for a day or two, as, if continued too long, the sulphur will in itself produce an eczematous condition.

Pediculi on the scalp may be safely and certainly got rid of by saturating the hair with ordinary paraffin oil and covering the head with a flannel cap. This may be applied on two successive nights. In pediculosis corporis a parasiticide lotion should be employed; the clothes must also be boiled. This precaution should also be taken in scabies.

Ringworm of the scalp is very obstinate, and we are usually compelled to vary the remedies used from time to time. We may apply tincture or liniment of iodine, glycerine of carbolic acid, or sulphurous acid. A useful ointment is:—℞. hydrarg. ammon. 15 to 30 grs., sulph. praecip. 1 to 1½ drs., thymol 10 grs., ung. simpl. 1 oz. If the patches are small and few in number, pure carbolic acid may be painted over them. It produces suppuration in the hair follicles, and may in this way lead to a cure. In the treatment of favus the same remedies are needed, but here systematic epilation is almost essential to the cure.

POSOLOGICAL TABLE.

N.B.—*When the drug is administered by the rectum the dose is double that stated.*

	Three Months.	Six Months.	One Year.	Five Years.
Acid. hydrochlor. dil.,	½ - 1 m.	1 - 2 m.	2 - 4 m.	5 m.
Acid. hydrocyan. dil.,	...	...	...	1 - 2 m.
Ammonium benzoate,	...	½ - 1 gr.	2 grs.	3 - 5 grs.
Ammonium bromide,	1 - 2 grs.	2 - 4 grs.	3 - 5 grs.	6 - 8 grs.
Antipyrin, . . .	...	1 gr.	1 - 2 grs.	3 - 5 grs.
Aqua anethi, . .	ʒi	...	...	...
Bismuth, carbonate, and subnitrate, .	1 - 3 grs.	2 - 4 grs.	4 - 10 grs.	10 grs.
Bismuth salicylate, .	¼ - ½ gr.	½ - 1½ grs.	2 - 6 grs.	3 - 8 grs.
Bromoform, . .	1 m.	1 - 2 m.	2 - 3 m.	5 - 10 m.
Butyl chloral hydrate,	...	1 - 2 grs.	2 - 4 grs.	3 - 8 grs.
Chloral hydrate, .	½ gr.	1 gr.	1½ - 3 grs.	4 - 7 grs.
Creasote, . . .	...	...	...	1 - 2 m.
Decoctum scoparii, .	...	...	...	ʒi - ʒij
Ext. cascaræ sagradæ liq., . . .	...	1 - 2 m.	2 - 3 m.	5 - 15 m.
Ferri carbonas saccharata, . . .	...	1 - 2 grs.	2 - 5 grs.	3 - 5 grs.
Hydrargyri subchloridum, . . .	⅙ gr.	⅙ - ¼ gr.	⅙ - ¼ gr. (purgative 1 - 1½ grs.)	2 - 4 grs.
Hydrarg. cum creta, .	¼ gr.	¼ - ⅓ gr.	⅓ - 1 gr.	...
Infusum digitalis, .	...	...	...	ʒss - ʒi
Infusum kousso, .	...	...	...	℥iv
Infusum rhei, . .	...	...	...	ʒij - ʒiv
Liq. ammon. acetat.,	...	ʒss	ʒi	ʒij - ʒiij
Liq. arsenicalis, . .	...	½ - 1 m.	1 - 2 m.	2 - 10 m.
Liq. calcis, . .	ʒi	ʒi - ʒij	ʒii - ʒiv	...
Liq. ferri perchlor., .	1 m.	1 - 2 m.	1 - 3 m.	4 - 8 m.
Liq. magnesii carbonat., . . .	ʒss - ʒi	ʒi - ʒij	ʒij - ʒvj	℥ss - ℥i
Liq. strych. hydrochlor., . . .	...	...	1 m.	1 - 2 m.
Mist. sennæ co., .	...	ʒi	ʒi - ʒiij	℥ss - ℥i
Oleum morrhuæ, .	15 m.	ʒss	ʒss - ʒi	ʒi - ʒij
Oleum phosphorat., .	...	½ - 1 m.	1 - 2 m.	...
Oleum ricini, . .	ʒss	ʒss - ʒi	ʒi - ʒiss	ʒij
Phenacetin, . .	...	...	1 - 2 grs.	3 - 5 grs.
Phosphorus, . .	$\frac{1}{200}$ gr.	$\frac{1}{120}$ gr.	$\frac{1}{100}$ - $\frac{1}{60}$ gr.	...
Potassium bromide, .	1 - 2 grs.	2 - 4 grs.	2 - 5 grs.	4 - 8 grs.
Potassium iodide, .	...	1 gr.	2 - 4 grs.	3 - 7 grs.

POSOLOGICAL TABLE (*continued*).

	Three Months.	Six Months.	One Year.	Five Years.
Pulv. cretæ cum opio,	...	1 gr.	2 - 4 grs.	3 - 8 grs.
Pulv. ipecac. co., .	...	...	$\frac{1}{2}$ - 1 gr.	1 - 3 grs.
Quinine sulphate, .	...	$\frac{1}{4}$ - $\frac{1}{2}$ gr.	1 gr.	1 - 3 grs.
Santonine, . . .	...	...	...	2 - 4 grs.
Sodium bicarbonate, .	1 - 2 grs.	2 - 3 grs.	3 - 4 grs.	5 - 10 grs.
Sodium phosphate, .	...	...	2 - 5 grs.	10 - 15 grs.
Sodium salicylate, .	...	$\frac{1}{2}$ - 1 gr.	1 - 2$\frac{1}{2}$ grs.	5 - 8 grs.
Spir. æther. co., .	1 - 2 m.	2 - 4 m.	4 - 6 m.	5 - 10 m.
Spir. æther. nitrosi, .	1 - 2 m.	2 - 4 m.	4 - 6 m.	5 - 10 m.
Spir. camphoræ, .	1 - 2 m.	2 - 4 m.	4 - 6 m.	5 - 10 m.
Spir. chloroformi, .	1 - 2 m.	2 - 4 m.	4 - 6 m.	5 - 10 m.
Syr. ferri iodidi, .	...	...	5 - 20 m.	ʒi
Syr. scillæ, . .	...	5 - 10 m.	10 - 20 m.	20 - 30 m.
Tinct. belladonnæ, .	...	$\frac{1}{2}$ - 2 m.	2 - 10 m.	10 - 30 m.
Tinct. camph. co., .	...	1 - 3 m.	2 - 5 m.	5 - 10 m.
Tinct. digitalis, . .	$\frac{1}{2}$ m.	$\frac{1}{2}$ - 1$\frac{1}{2}$ m.	1 - 2 m.	2 - 5 m.
Tinct. hyoscyami, .	2 m.	2 - 5 m.	3 - 6 m.	5 - 10 m.
Tinct. nucis vomicæ, .	...	...	1 - 2 m.	2 - 4 m.
Tinct. opii, . .	$\frac{1}{6}$ m.	$\frac{1}{4}$ m.	$\frac{1}{2}$ m.	1 - 4 m.
Vinum ipecac., . .	2 m.	2 - 3 m.	5 - 7 m.	10 - 15 m.
Vinum ipecac. as emetic, . . .	10 m.	10 - 15 m	ʒi - ʒij	ʒij - ʒiij

TABLE OF DOSAGE OF OPIUM.

	Tincture of Opium.	Dover's Powder.
From 3 to 6 weeks, . .	$\frac{1}{10}$ min.	$\frac{3}{4}$ gr. divided into 10 doses.
,, 6 weeks to 3 months,	$\frac{1}{7}$,,	1 gr. ,, ,,
,, 3 to 6 months, .	$\frac{1}{5}$,,	1$\frac{1}{2}$ grs. ,, ,,
,, 6 to 12 ,, . .	$\frac{1}{4}$,,	2 grs. ,, ,,
,, 1 to 2 years, . .	$\frac{1}{2}$,,	3 grs. ,, ,,

SECTION II.

CHAPTER V.

DIAGNOSIS.

METHOD OF EXAMINATION—ANAMNESIS.

Contents.—Method of Examination—Case-taking Card—Anamnesis—Family History—Previous History—History of Present Illness—Hygiene and Surroundings.

For a complete diagnosis of the morbid condition present in any patient it is advantageous to make use of a systematic method of examination; it is necessary to be able to interpret accurately the signs and symptoms thereby elicited; and for the record of the facts discovered some definite scheme of case-taking should be employed. We propose, therefore, to discuss the subject under three heads:—1, Method of examination; 2, Case-taking; 3, Clinical diagnosis.

METHOD OF EXAMINATION.

The anamnesis is shorter than in the adult, and the mother's statements of fact (as opposed to her inferences therefrom) are, as a rule, reliable. Her general opinion of the progress of the case from day to day is usually worthy of consideration, though her reasons for her opinion may not always commend themselves to our judgment. If possible the history should be got, in part at least, before the child is seen.

There can be no question of the necessity of examining all cases in as systematic a manner as possible. In adult patients this is as a rule not difficult, and by the constant use of a good method the student is enabled at a later period to examine his patients completely and yet so rapidly as not to inconvenience them. In the child, however, matters are somewhat different. Here no hard and fast scheme will suit all cases, and if the practitioner be not ever on the alert to carry out any part of his examination at the moment most favourable for it, he will certainly find at the end of his visit that, for the time at least, he is deprived of valuable information.

In the adult, after having taken note of sundry general conditions, we are accustomed to carry out the examination of the systems of the body in a definite order. In the child such a procedure is usually impossible. As a concrete example we may instance the inspection of the throat, a point which should never be neglected in the sick child. To take this at an early period of the examination will probably cause so much disturbance as to render further investigation futile. On the other hand, some routine must be preserved or important features of the case will almost certainly be passed over. If, therefore, instead of taking the *systems* of the body and examining each thoroughly before passing to the next, we take as our guide the different *methods of examination* and successively employ each to its full extent, a distinct advantage will be gained. Following this line of investigation, we first employ the method of inspection (including under this term the use of the senses of hearing and smell as well as that of sight), then we palpate, next auscultate, then percuss, and, finally, make a special and more detailed investigation of such organs as the nature of the case may seem to indicate. We adopt this sequence on the principle that all steps likely to prove irksome to the child must be delayed in order that the restlessness they produce may not interfere with the rest of our examination. Most of the examination will be conducted with the child lying on its back. It is best, therefore, to examine by inspection, auscultation, &c., over the front of the body before passing to the back.

It must again, however, be insisted upon, that it is most essential to depart from the routine as occasion requires. If the child be sleeping, opportunity should be taken to notice the rate and rhythm of the respiration, the position of the body, to count the pulse, and, if possible, to take the temperature. Further, any prominent symptom or complaint may entirely alter the course of our examination. There is no particular difficulty in examining a child on the lines indicated. A little tact will often soothe a frightened child, a little perseverance overcome an obstinate one. It is well to call the patient by his name, and the examination is often made easier if the attention be diverted in some way. It is best to examine a young child stripped, wrapped in a blanket, and placed on its mother's knee. In this position less exposure is needed and the child is not so likely to be alarmed.

After the ordinary examination is over, some more particular investigations may require to be made—*e.g.*, inspection of the throat, ear, or eye, examination of the blood, exploratory puncture, &c. These we postpone until the end, as many of them are apt to upset the patient. It may also be desirable to examine the urine and fæces, effusions of fluid, &c.

In children over the age of six or seven we may conduct the examination exactly as in the adult. It should be borne in mind that children stand chloroform well and suffer little from its after-effects ; there should, therefore, be no hesitation in having recourse to it if needful.

CASE-TAKING CARD.*

Name — Age — Address — Complaint — Duration — Date of Examination.

Family History.—*Parents:* rheumatism, syphilis, tubercle, nervous diseases, (in case of mother, abortions). *Brothers and sisters:* number alive, ages, health—previous and present; number dead, age and cause of death.

Personal History.—*Previous health:* birth—full-time or premature; nature of labour; feeding—exact nature; dates of closure of fontanelle, of appearance of teeth, of walking, of speaking; state of bowels and digestion. Fits, snuffles, infectious diseases (especially measles, scarlet fever, and whooping-cough), skin eruptions, sore throats, rickets, otorrhœa, enlarged glands.

Surroundings.—Present illness: date of commencement; symptoms—appetite, vomiting, diarrhœa, convulsions, cough, pain, breathlessness, interference with sucking, sleep, feverishness.

State on Examination—1. *General.*—Position, facies, crying, sucking, sleep; gait, deformities, obvious abnormal movements; state of nutrition. Temperature.

2. *Examination of Skin.*—Colour, moisture, œdema, scars. Eruptions—character and distribution.

3. *Alimentary System.*—Lips, mouth, tongue, gums, teeth, palate, tonsils, fauces, and pharynx (membranes—colour, distribution, detachibility). Thirst, appetite, vomiting, state of the bowels. Vomited matters, fæces. Abdomen: inspection, palpation, percussion (general, and of special viscera).

4. *Hæmopoietic System.*—Spleen, glands, thymus, thyroid, blood (enumeration of corpuscles and microscopical examination).

5. *Respiratory System.*—Epistaxis, dyspnœa, voice and cry, respiratory stridor, cough, pain in chest, expectoration. Chest: inspection—nose, form of thorax, movements, retraction; palpation—crying fremitus; auscultation; percussion; exploratory puncture.

6. *Circulatory System.*—Heart: inspection—apex-beat, præcordial prominence or retraction, abnormal pulsations; palpation; auscultation; percussion. Pulse: rate, rhythm.

7. *Genito-urinary System.*—Control of the bladder; dysuria; examination of the kidneys, bladder, and external genitals. Urine—quantity, naked-eye, chemical, and microscopical characters.

8. *Nervous System.*—Cranium—size and shape. Fontanelle—size and movements. Spine—form, pain, rigidity; (lumbar puncture). Mental condition; speech. Sensory functions; eye—sight, position, movements; ear. Motor functions; reflexes; involuntary movements; spasms and contractures; convulsions. Trophic functions.

9. *Locomotory System.*—Joints; epiphyses; shafts; muscles.

Diagnosis—Treatment—Progress—Result.

---

* To be used as a method of recording facts elicited subject to the suggestions made in the "Method of Examination." *N.B.*—This card is arranged in the same order as the succeeding sections on clinical diagnosis, and will therefore serve in some sort as an index to them.

ANAMNESIS.

Family History.—In many of the diseases of children this is of the utmost importance. The general health of the father and mother (of the latter especially during her pregnancy) must be inquired into; in some cases the existence of consanguinity may be noted.*

At times a history of syphilis in the father or mother must be carefully sought for. It is seldom advisable to put the question directly, but a fairly accurate conclusion can often be arrived at by enquiring for such secondary symptoms as sore throat, cutaneous eruptions, and falling-out of the hair. Very often the occupation of the father may give us a hint as to the probability of infection. More important, however, is the reproductive history of the mother: a sequence of miscarriages, of still births, of infants dying soon after birth, and of children showing such signs as snuffles, or rashes upon the buttocks, hands, or feet, in the first few weeks of life, renders the diagnosis certain. On the other hand, too much importance must not be attached to a history of one or two abortions. Few women have never miscarried, at all events towards the end of their reproductive period; it is therefore only upon miscarriages occurring in the earlier pregnancies that we can place any diagnostic value.

Tubercle in the parents or near relations forms a further subject of investigation. The mother can infect the child directly, but much more often the offspring inherits only a deficient power of resisting the bacillus of tubercle. We ask if the family is a consumptive one, and whether other children have suffered from "dwining," "consumption of the bowels," chronic diarrhœa, enlarged glands, abscesses, spinal disease, &c.

The rheumatic diathesis manifests itself in the elders by the usual symptoms. In the younger members of the family, however, we have to enquire as to "growing pains," repeated sore throat, St. Vitus' dance, evanescent skin eruptions, and heart disease.

From the rarity of the disease in childhood, a family tendency to gout is seldom a matter of interest, but in some urinary affections (especially where there is a suspicion of calculus), and in asthma, psoriasis, and certain cases of eczema, it is well to ask whether any relations have been gouty.

In almost no class of maladies does heredity so much affect the prognosis as in functional nervous disorders. In cases of recurring convulsions, for example, it is of no little importance to know whether parents or near relatives have suffered from epilepsy, hysteria, chorea, asthma, or insanity. The extreme interchange-ability of the neuroses in different generations and individuals must be borne in mind, and the frequency with which alcoholism and syphilis are found in neurotic families should never be forgotten. In certain of the so-called "family nervous diseases," such as Friedreich's ataxia and the various muscular dystrophies, it is necessary to investigate most carefully the exact distribution of the disease among the members of the family; and this especially with regard to the sex of those affected and of those by whom it has been transmitted, as well as its main features in each individual case.

---

* Much stress is often laid by the mother both on her physical condition and on her environment during her pregnancy; should therefore any abnormality in the child be attributed to a maternal impression it is right to enquire (*a*) the period of pregnancy at which the impression was received; (*b*) the nature and duration of the impression; (*c*) whether any *ante partum* statement was made regarding it; (*d*) to what extent the abnormality resembles its alleged cause.

A somewhat similar line of enquiry must be pursued in certain hæmorrhagic diseases, particularly if a suspicion of hæmophilia exists, since here, as is well-known, the affection is transmitted to the males through the females, who are, as a rule, themselves spared. In some other blood disorders a history of malaria in the parents, or of their prolonged residence in an ague district, may prove of diagnostic importance.

In many cases of deformity questions will elicit the history of a similar or other abnormality. This is especially the case in such conditions as polydactylism, club-foot, club-hand, hare-lip, cleft palate, spina bifida, meningocele, &c.

On the other hand, malignant disease is so rare in children that it is scarcely ever necessary to make any exact inquiry regarding its presence in the family.

Previous History.—The previous history of the patient is of the utmost importance, and it is well to cultivate the habit of enquiring about the child's health from the time of birth down to the commencement of the present illness.

It is often desirable to know whether there was any difficulty at birth; whether the labour was instrumental, or whether the child presented in other than the usual way. Certain forms of paralysis, such as paraplegia and facial paralysis, may result from injury to the head by pressure on the maternal tissues, or, in instrumental cases, from pressure of the forceps. Others may be due to the traction exerted in delivery, while from a similar cause—most frequently in breech presentations—we may have fracture of the long bones or hæmatoma of the sterno-mastoid, the latter possibly in some cases resulting in wry-neck.

Next, one enquires whether the child was healthy and well nourished when born, or whether it was premature; and whether it cried and breathed freely or required resuscitation. Any morbid appearance noticed at birth—such as desquamation or other cutaneous affection of the palms and soles, as sometimes seen in severe congenital syphilis—must be carefully investigated, and a note is to be made of any deformity observed.

The next point requiring attention is as to whether the infant was fed on the breast or artificially. In the latter case, we endeavour to ascertain the cause, which may have been weakness on the part of the child and consequent inability to suck, or, on the part of the mother, deficient secretion of milk or disinclination to nurse. We enquire further whether cow's milk was used, its dilution, and the diluting agent employed, whether the food was boiled or otherwise sterilised, and whether anything beyond a mere diluent was added. If the child was reared upon condensed milk or other artificial food, the same questions (and particularly whether cow's milk was used as a diluent) require to be put, and in addition the exact nature of the food should be noted. As infantile diarrhœa is almost always due to dietetic error, one should never in such a case be satisfied with the statement that the child has been breast or bottle fed, but should ask if it did not also get some solid food, or if it was not allowed to eat at the table. Then we enquire how often the baby was fed, what quantity it received at each feeding, what sort of bottle was used—whether or not it had a tube, and how it was cleaned. Finally, when was the child weaned, and when did it begin to get solid food. Has it always thriven well, or was any change of food needed from that first given. To sum up: we find out what food the child got, how much it got, and how often it was fed; the information thus obtained is of the greatest importance in cases of wasting, diarrhœa, vomiting, constipation, flatulence, fretfulness, fits of crying, &c.

We next proceed to ask whether there has been vomiting or diarrhœa, and if so, their relation to the ingestion of food, and the nature of the vomited matters and stools. Constipation is less frequently observed, and, unless in cases of suspected tubercular meningitis or intestinal obstruction, is, on the whole, of minor importance.

If vaccination has been performed we find out whether it has been successful or whether any untoward consequences are attributed to it. Some caution must be exercised in accepting the statements of parents in this respect, as any illness occurring within months of the operation is likely to be ascribed to it.

Dentition marks so important an epoch in the child's life that we never omit to ask when the infant got its first teeth. Here again the same reserve must be maintained as has been indicated in the preceding paragraph; the importance of teething in the provocation of disease is immensely overrated by the vast majority of mothers. Late dentition and the irregular eruption of the teeth is suggestive, but by no means pathognomonic, of rickets, and, as has been stated in a previous chapter, artificially fed children get their teeth at a somewhat later period than those reared at the breast. In older children we enquire if the teeth are healthy or if they decayed early.

We ask how old the child was when he first tried to stand, and when he began to walk. After beginning to walk did he again lose power in the legs, and if so, was this sudden or gradual, and was it due to weakness in one or both limbs. A gradually increasing weakness is common in rickets, whereas a sudden complete loss of power is suggestive of a nervous origin. The history may of course show that the child has never attempted to walk.

Reliable information as to the size and date of closure of the fontanelle can seldom be obtained. We may enquire whether it seemed larger than usual, and whether the skull felt softer than normal, or, on the other hand, whether it became consolidated sooner than in other children. In cases of rickets a history of sweating about the head is often to be obtained. If congenital syphilis be suspected our enquiries should be directed to the existence of snuffles, of rashes on the buttocks and thighs, or of patches about the mouth, anus, and female genital organs. It must be remembered that these manifestations are usually delayed until a few weeks after birth. Owing to the extreme prevalence of rickets it is usual to ask whether swellings of the ends of the long bones or on the ribs have been remarked. Have fits of any kind occurred? If so, what was their nature? Special enquiry should be made as to whether they were unilateral or general; the former are of much more serious import than the latter. Have the seizures been numerous, and have their characters always remained the same? Were they associated with laryngeal disturbance, such as "crowing?" Bronchitis and diarrhœa are very frequently present in cases of rickets and should always be enquired for.

Middle-ear disease is so common in infancy that it is almost a matter of routine to ascertain whether the patient has ever suffered from otorrhœa. In acute otitis we sometimes elicit a history of the child screaming and putting up his hands to his ears.

Enlarged glands are frequently complained of, and it is well to ascertain the exact site at which they were first noted, how long they have been present, whether other glands have become affected, what treatment has been adopted, and to what result it has led.

The zymotic diseases from which the child has suffered, with their sequence and severity, and whether or not complete recovery ensued, should next be learned. Those whose results are most far-reaching are whooping-cough, measles, and scarlet fever, and the sequelæ to which special attention should be directed are:—bronchitis, pneumonia, glandular enlargements, wasting, chronic diarrhœa, otorrhœa, dropsy, rheumatism, loss of hair, paralyses, and affections of speech. When the previous existence of rheumatism is suspected we ask about "growing pains," repeated attacks of sore throat, St. Vitus' dance, and skin eruptions. Very often all these will be found to have occurred at different periods, and an attempt should be made to learn their chronological order.

History of Present Illness.—Much that has been already stated with reference to the line of enquiry as regards the previous health will be found applicable to the investigation of the present illness. It is important to ascertain as exactly as possible the date of commencement; this information may be best obtained by asking when the child was last in its usual health. It must, however, be remembered that the actual acute onset may have been preceded by vague symptoms of illness, which escape the mother's recollection unless recalled to it by suitably directed interrogation. Although they can rarely entirely be dispensed with, too many leading questions should obviously be avoided. Having thus discovered when the illness originated, it is well to enquire as to its rate of progress and its supposed cause. Very often such answers are received as "teething," "hives," or "worms." Of the first it is sufficient to say that, save in rare instances, it cannot be regarded as exciting disease; and of the last, that only the actual presence of worms, and not merely the occurrence of those symptoms which they are popularly believed to produce, is to be held as a proof of their existence.

Should the onset be sudden we ask if the child seemed feverish; if so, how long this feverishness lasted, and at what part of the day it occurred. The symptoms most commonly associated with acute febrile disease are vomiting, pain, sore throat, cough, convulsions, eruptions, prostration and fretfulness, and derangement of the bowels. A rigor is seldom seen in the initial stage of an acute illness in a child; but a convulsion (said to replace the rigor) is not infrequent. As regards vomiting, it should be noted whether or not it was associated with the taking of food, and particularly whether diarrhœa or constipation was present along with it. Little value can be placed on the character of the vomiting; children bring up the stomach contents easily, and accordingly what would in the adult be suspicious of cerebral vomiting, has in the child less significance. When due to digestive disturbance, vomiting is very often associated with diarrhœa; should the bowels be obstinately confined one's thoughts are turned more in the direction of cerebral disease or intestinal obstruction.

While it is, as a rule, easy to say from the distress of the child and the character of the cry whether or not it is in pain, it is much more difficult to ascertain the seat of the pain. A hint may be gained from the position and movements of the child. Pain in the abdomen is usually associated with drawing up of the legs, distension of the belly, and rigidity of the muscular walls. Pain disappearing after micturition points to affection of the genito-urinary tract; pain after coughing, to the respiratory organs. In inflammatory conditions about the throat the hand is often put up to the back of the neck, and in middle ear disease to the side of the head. Pain when the patient is moved suggests some morbid condition of the locomotory system, pain relieved by movement is most likely due to gastro-intestinal derangement.

In an infant, sore throat or any other inflammation about the mouth is indicated by resistance to attempts at giving the breast or bottle. The nature of the cough, and whether it is worst by day or night should be investigated. In pertussis, as we may not have a chance of hearing the cough, and the physical examination may reveal little, we have often to rest our diagnosis to a large extent on the history. Cough, occurring in paroxysms chiefly during the night, and associated with vomiting, renders the diagnosis almost certain. It is of little use enquiring as to expectoration, for the simple reason that up to about the sixth or seventh year children almost invariably swallow expectorated matters.

A description of the convulsion should be obtained, and a note taken of its duration and distribution. General eclampsia is of comparatively little consequence at the beginning of an acute illness: occurring later, it often ushers in the fatal termination. Unilateral or partial convulsions are of much more serious omen than those which are generalised. They are frequently significant of grave intracranial lesion. The exact time at which an eruption was first noticed is of importance, as also are the part of the body on which it was then situated, its course, and its general character. Assistance in the diagnosis of the exanthemata may be gained by learning whether the face was affected or spared, and in this connection the distinction between mere febrile flushing and an actual rash on the face should be borne in mind. *Cæteris paribus*, itchiness of an eruption is rather against, and its absence rather in favour of, the presence of one of the eruptive fevers. A history of exposure to infection may in some cases be sought.

The diet preceding the onset of the illness must be enquired into.

An attempt should be made to find the approximate number of motions in the day. Their size and appearance should be noted, and also the occurrence of pain as the bowels act. The pain may precede, and be relieved by the passage of the motion, or may succeed it and be associated with straining efforts. It is well also to enquire whether much flatus is passed, as well as the relation of the motions to the ingestion of food. In all acute affections we make a point of asking how the patient is taking nourishment, and endeavour to find out the exact amount taken in the twenty-four hours.

In diseases beginning acutely, but without fever, the most common initial symptoms are diarrhœa, convulsions, vomiting, headache, and cough. In more chronic illnesses the general symptoms — the appetite, digestion, state of the bowels, sleep, and the existence of abnormal languor or fretfulness should be noted. Sweating about the head, throwing off bed-clothes, and discomfort when the limbs are touched, are frequent in rickety children. Growing pains, chorea, and rashes are often combined in rheumatic cases; and snuffles, skin eruptions, and breaking out about the buttocks and mouth, in syphilis. Wasting, enlargement of the glands, cough, swelling of the abdomen, and diarrhœa with some fever are common features of tuberculosis. In cerebral diseases, vomiting, convulsions, paralysis, and headache must be enquired for; in cases of paralysis its extent and the nature of its spread must be ascertained, as well as whether it gradually became worse, or suddenly attained its maximum and then improved rapidly. It must not be forgotten that children suffer from hysteria, and that the condition is by no means confined to the female sex. In these cases the history is of the greatest guidance.

In many skin diseases it materially assists the diagnosis to ask if other children in the house are affected.

By such a method of investigation we are usually enabled to discover the system or systems of the body affected, and must then make such further enquiry as the nature of the case may seem to indicate.

Hygiene and Surroundings.—The locality of the house and the number of rooms it contains will often give a clue to the general status and surroundings of the patient. We may enquire as to the state of the drains, as to the number of persons sleeping in the patient's room, into the ventilation of the room, whether it is damp, and particularly whether it is well-lit, or dark and dingy. Bathing, exercise, and, in older children, the standard at school, the amount of lessons requiring preparation at home, and the games indulged in, form suitable objects of investigation.

Though we have dealt thus minutely with the anamnesis, that it is really of rather less importance in the child than in a grown-up person, and that in many cases we have entirely to dispense with it and to rely only upon the examination, will be obvious on a moment's consideration.

CHAPTER VI.

DIAGNOSIS (*Continued*).

GENERAL EXAMINATION—TEMPERATURE—EXAMINATION OF SKIN.

Contents.—General Examination—I. Position—II. Facies—III. Obvious Morbid Appearances and Actions—Crying—Sucking—Sleep—Gait—Other Characteristic Appearances—**IV. General State of Nutrition—Observation of the Temperature—Examination of the Skin and Subcutaneous Tissues—I. Colour**—Pallor—Excessive Redness—Cyanosis—Icterus—Discolouration of the Skin—**II. Moisture of the Skin—III. Œdema—IV. Subcutaneous Emphysema—V. Cicatrices and Scars—VI. Cutaneous Eruptions**—1. Erythematous or Macular Eruptions—2. Papular Eruptions—3. Hæmorrhagic Eruptions—4. Scaly Eruptions—5. Vesicular Eruptions—6. Pustular and Crusted Eruptions—7. Other Cutaneous Lesions.

GENERAL EXAMINATION.

In the clinical examination of the child the first step is to take a general survey of it as it lies in its cot or sits upon its mother's knee. From this much information may be gained, and the points to be observed may be considered under the heads of :—I. Position ; II. Facies and conformation of the head ; III. Obvious morbid appearances and actions ; IV. General state of the nutrition.

I. POSITION.

During the first few weeks of life the infant is generally asleep when it is not taking nourishment; later, it lies watching with interest whatever is going on around. The most common position is the lateral one with the body and limbs flexed, but often enough the child lies on its back and throws its limbs about freely. Premature children usually assume a position of exaggerated flexion, which no doubt preserves the warmth so necessary for them. Marked flexion of the body and extremities is also seen in cases of cerebral irritation. Even when seriously ill a child may lie on the side, thus contrasting with what we see in the adult, in whom the dorsal attitude is usually assumed in serious disease. A change from the dorsal to the lateral decubitus, so favourable a sign in the fully-grown patient, is therefore of little or no significance in the child.

A rolling motion of the head is often seen in rickets, in which disease the constant rubbing of the hair on the back of the scalp against the pillow may lead to actual baldness. Rolling may also be found in meningitis and other forms of cerebral irritation. Marked retraction of the head is a very important sign in some children's diseases; it is seen in all forms of meningitis affecting the base of the brain, as in tubercular meningitis, meningitis following middle ear disease, and simple basal meningitis. In the last-named it is especially distinct. It is also occasionally found in tumours and other lesions of the cerebellum. Like extreme retraction of the head, opisthotonos is most frequently seen in simple basal meningitis. It may also occur in tetanus, and may now and then be due to hysteria.

Spasmodic flexion of the legs upon the abdomen, with a cry of pain, wrinkling up of the features, and hardening of the belly, is a common feature of gastro-enteritis and all forms of intestinal colic. Vomiting and the passage of flatus often relieve it. The various forms of dysuria may also lead to the drawing up of the legs with signs of pain. The dorsal position, with flexion of the legs at the hips, and rigidity of the abdominal walls, points to an acute inflammatory condition in the abdomen.

Orthopœna is less frequently seen in childhood than in later life. It occurs in chronic pulmonary disease and in some cardiac affections, especially in pericarditis, acute carditis generally, and congenital heart disease. It is seldom seen in bronchitis or pneumonia, possibly because the child suffers too readily and severely from carbonic acid poisoning. In bad cases of adenoids with hypertrophy of the tonsils the head requires to be considerably raised before the patient can sleep. In laryngeal stenosis, membranous or other, the child will also sit up, at the same time clutching at the throat as if to remove the cause of obstruction.

Immobility is usually due to a motor paralysis or to an affection of the bones leading to pain on movement. It is, therefore, present in rickets, and very markedly in syphilitic epiphysitis and scorbutus.

While it may occur in any of the forms of acute arthritis, it is not well marked in the most common of them all; for in acute rheumatism we do not see in the child that great powerlessness to which we are accustomed in adult patients.

The contractures of tetany or carpo-pedal spasm may often be noticed. The thumbs are drawn in to the palm, and the fingers flexed over them; the toes are turned in towards the sole, and the dorsa of the hands and feet are slightly œdematous (Fig. 1).

II. FACIES.

Many years ago attention was drawn to differences in expression in various diseases, from the presence of certain lines produced on the face in infancy. These have been named after the observer who first described them as "Jadelot's lines." The first is one running from below the inner canthus of the eye beneath the lower eyelid on to the cheek. The presence of this line was said to point to some cerebral affection. Another runs downwards from the upper part of the ala of the nose and curves round the corner of the mouth. This line is present in gastro-intestinal derangement. A third line begins at the angle of the mouth and passes outwards to the cheek; it is shallower than that last-mentioned, and points to disease of the lungs or of the respiratory passages. Whilst, no doubt, the significance of these lines may easily be exaggerated, their presence should be noted. The second of them is well marked and has usually the meaning ascribed to it by Jadelot.

Knitting of the eyebrows may be seen in headaches as well as in many eye affections; it is frequently very marked in Mongol idiots. In severe abdominal disease a peculiar pinching of the features is observed, usually with pallor and coldness of the nose and ears. An appearance of extreme anxiety, with rapid respiration and slight cyanosis, may be observed in many pulmonary and cardiac diseases, such as severe bronchitis, broncho-pneumonia, pleural effusions, pericarditis, congenital heart disease, and serious valvular mischief. There is often associated with it an exaggerated action of the alæ nasi. In whooping-cough there is usually some puffiness beneath the eyes, along with a swollen, livid, and watery appearance of the conjunctivæ. The pasty œdema of the face in Bright's disease is well known, and it is worthy of remark that in simple anæmia a somewhat similar facies is common (Fig. 2).

Pursing of the mouth, redness of the lips, and dribbling of saliva suggest the presence of stomatitis, whilst pouting of the lips, with the risus sardonicus is indicative of tetanus.

In children the subjects of epilepsy the face is somewhat vacant; an acne rash from the administration of bromide may be present; petechiæ are often visible, and the tongue shows signs of having been bitten. In epileptic imbeciles some of the stigmata of degeneration may also be seen—*e.g.*, asymmetry of the skull and face, malformation of the ears and palate, unequal development of the limbs, and stunted growth. The choreic child has a mobile, somewhat fatuous expression, shows signs of loss of temper, is emotional, restless, and fidgetty. The sudden wide opening of the mouth and raising of the eyebrows as the child is asked to show the tongue, the rapid protrusion of the organ, the quick withdrawal followed by snapping closure of the jaws, are very characteristic even in slight cases of chorea. In Graves' disease the patient has an excited appearance, but there is seldom so much protrusion of the eyeballs as in exophthalmic goitre in adults. When adenoids are present a very typical facies results (Fig. 3). The expression is dull and stupid, the face is elongated, the mouth is open, the base of the nose flattened, whilst the alæ nasi are dimpled laterally. The patient breathes through the mouth, and there is often a nasal discharge, and usually some deafness. Two types of face have long been considered as showing a predisposition to tubercle ; one with bright eyes, long eyelashes, fine skin, and good complexion ; the other with heavy dull features, thick coarse skin, rough hair, thick lips, and a tendency to blepharitis and nasal discharge.

Rickets is shown by the large square forehead, sometimes with frontal and parietal bosses, the flattened vertex, the enlarged veins coursing over the skull, the somewhat round face, the delayed dentition, and the pallor (Fig. 4). The earlier stage of congenital syphilis shows the dusky wizened complexion, the premature ageing, snuffles, and cracks at the angles of the mouth. As later stages are reached we have the sunken bridge of the nose, the rhagades about the mouth, the peg-shaped teeth, and possibly interstitia keratitis. The pinched features, wrinkling, half open mouth and half closed eyes, and extreme emaciation of marasmus, are very characteristic.

Hydrocephalus is denoted by the dome-like enlargement of the skull over which distended veins pass, by the open fontanelle and gaping sutures, by the relative smallness of the face, by the turned down eyes showing the white sclerotic above, and occasionally by squinting. The head is heavy and requires some extra support to hold it upright. The hydrocephalic skull differs from that of rickets in that the vertex is round, not flat, and in the position of the eyes (Figs. 5 and 6). The small keel-shaped head and the want of intelligent expression at once show the microcephalic idiot, whilst the Mongolian type is characterised by the head being deficient posteriorly, by the silly, usually smiling face, the obliquely set eyes, and the furrowed protruding tongue.

The distinct, generally asymmetrical swelling of the parotid regions speedily leads to the diagnosis of mumps.

III.—OBVIOUS MORBID APPEARANCES AND ACTIONS.

Crying.—Much information may often be obtained from the presence and character of a cry. A healthy child but rarely cries, but, of course, its doing so does not necessarily denote any serious pain. Any slight discomfort leads, in a young infant, to crying, and ill-trained children, when in a bad temper, often cry vigorously and for a long time. As a rule, this is easily distinguishable from the cry present in serious illness. When crying persists it usually denotes pain or hunger. In a young infant earache is a common cause. If due to hunger, giving the breast or bottle will always quiet the child ; in pain the cry will only cease for a short time. The child may cry and drop the nipple out of its mouth immediately after being put to the breast. This suggests some local lesion, such as stomatitis, which renders sucking painful. Where there is earache, the little patient, in addition to crying incessantly, may be noticed to put the hand up to the side of the head. In tubercular meningitis and other forms of intracranial mischief there may be a sharp paroxysmal cry—the " hydrocephalic cry "—and the child at the same time carries its hand to its head. Intestinal colic often causes crying for a little time before the passage of flatus or fæces, and crying relieved by the passage of urine demands an examination of the genito-urinary tract. The last two conditions are usually associated with updrawing of the legs, hardness of the belly, restlessness, and expression of pain. An exception to the general rule that dandling and moving the patient tend to soothe him, is seen in scorbutus and also in rickets and other diseases of the locomotory system. Movement, touching the chest, and coughing often cause crying in cases of pleurisy and pneumonia. Huskiness is present in laryngitis, both simple and syphilitic ; in spasmodic croup the voice is harsh and brassy, and in diphtheria it usually becomes extremely faint. When the cry is loud and lusty there is almost certainly no very serious condition present, and when prolonged and present both during inspiration and expiration, it renders the existence of any grave respiratory affection at least improbable. When any such is present the cry is interrupted in order to allow the child to take breath. Though this is the general rule, there are exceptions to it, and we cannot absolutely rely on the occurrence of a loud strong cry as proof that the lungs are healthy. When there is much swelling about the nasopharynx the cry has a peculiar nasal character.

Sucking.—As we have already seen, sucking is chiefly performed by the tongue ; affections of the organ will, therefore, give rise to pain during the act, and cause the child to drop the nipple as soon as it is taken into the mouth. Aphthous stomatitis and other inflammatory conditions inside the mouth are shown in a similar way. At times, although apparently hungry, the child cannot go on sucking continuously for any length of time, but drops the nipple after a few greedy mouthfuls. This is a sign of breathlessness, which may be due either to obstruction of the nose, as in syphilitic rhinitis, or to some inflammatory condition of the respiratory organs. Frequent and greedy sucking is a very common symptom of gastric disturbance. The introduction into the stomach of fresh milk, will

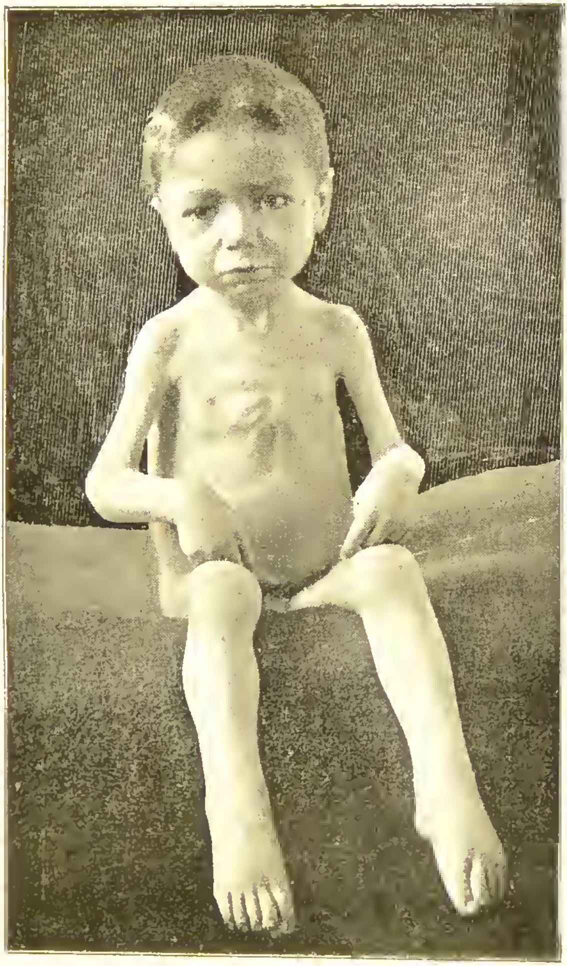


Fig. 1

TETANY

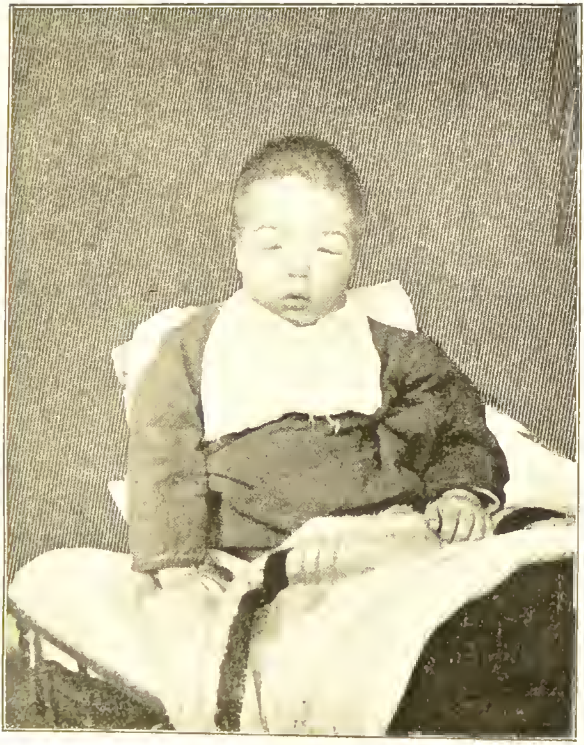


Fig. 2

POST-SCARLATINAL NEPHRITIS

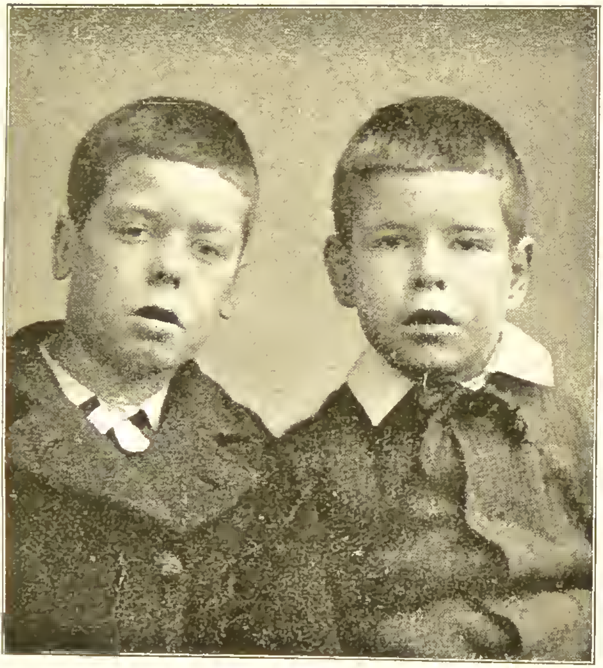


FIG. 3

TWO BROTHERS SHEWING THE ADENOID FACIES

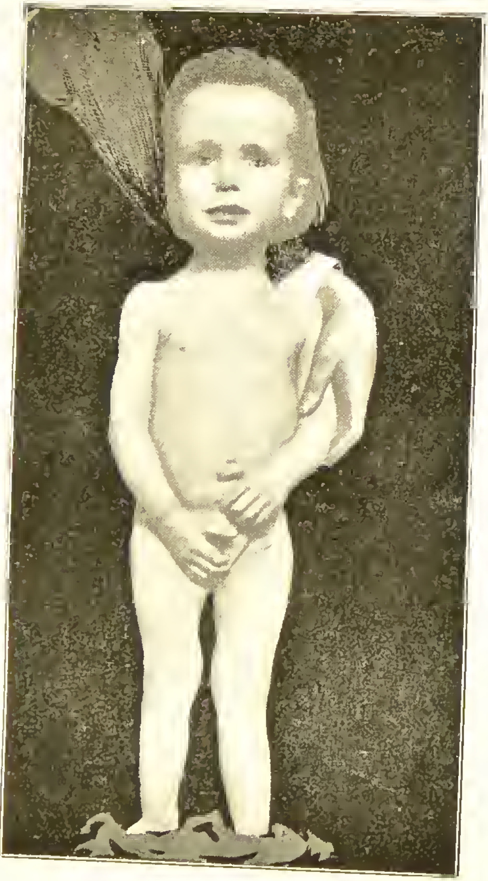


FIG. 4

RICKETY HEAD

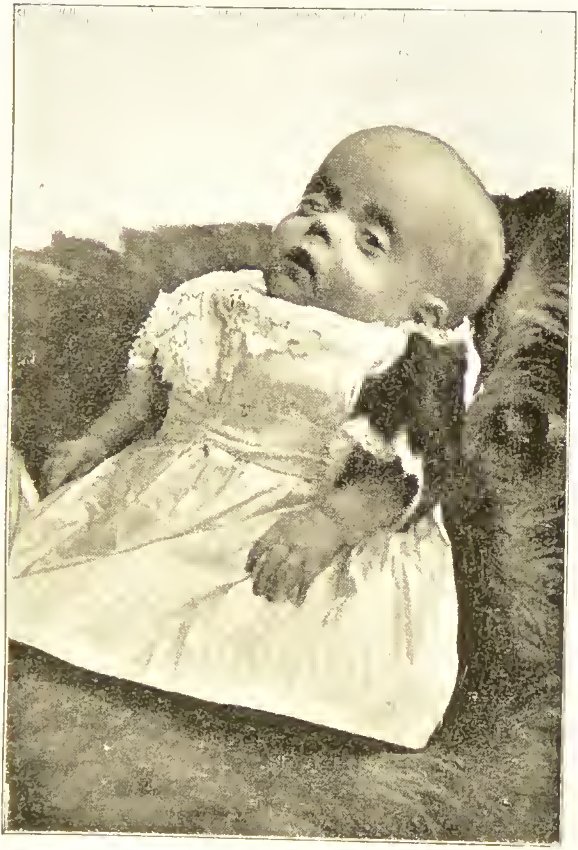


FIG. 5

SLIGHT HYDROCEPHALUS

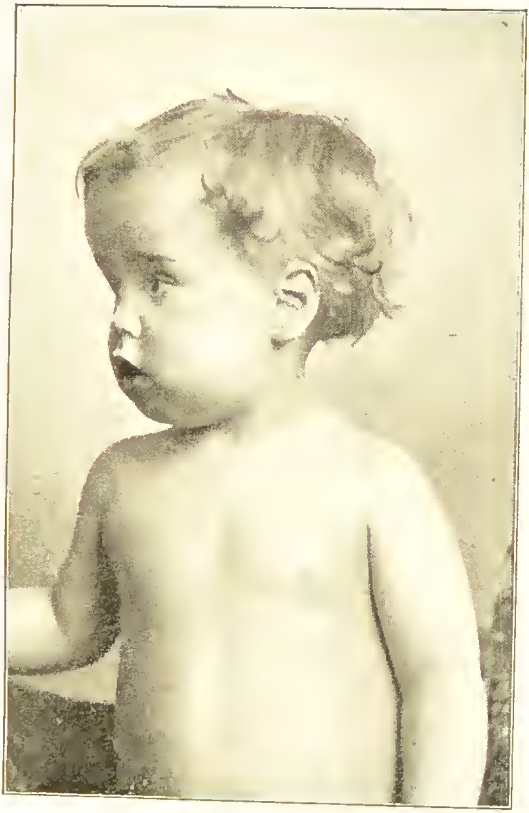


Fig. 6

CURED HYDROCEPHALUS

check any fermentative changes going on, but for the time being only. The relief gained is, therefore, merely temporary, and as the discomfort returns the patient cries for more food, which the mother is usually only too glad to give him, and thus an aggravated condition of affairs is brought about.

When the frenum linguæ is very short it prevents the tongue being protruded sufficiently to catch hold of the nipple, and the act of suction is thereby impaired or rendered impossible. Such an extreme form of tongue-tie is not common. The presence of hare-lip renders sucking difficult; in severe cleft palate it is impossible.

When the finger is placed in the mouth of a healthy infant he sucks it vigorously; diminution or disappearance of this is indicative of serious illness, and where it has been absent its re-appearance is, as a rule, a favourable sign.

Regurgitation of food through the nose may take place in extensive diphtheria of the palate and in post-diphtheritic paralysis. It is also seen in retropharyngeal abscess, and when choking occurs from any cause.

Sleep.—During sleep the healthy child lies with the eyes closed and the mouth very slightly open. When there is pain, and in illness of any gravity, the eyes are not completely shut. The position assumed in sleep is often of diagnostic importance. In adenoids the head is thrown back, the mouth widely opened, and snoring can often be heard. In rickets the child is restless, the head is wet with perspiration, and the bed-clothes are constantly thrown off. Among the chief disorders of sleep we may notice pavor nocturnus or night terrors, nightmare, pseudocroup, laryngismus stridulus, nocturnal enuresis, grinding of the teeth, and epilepsy.

Gait.—Whilst the infant usually begins to walk between the twelfth and the fourteenth months, no alarm need be felt although it be the sixteenth month before the act is accomplished. But if the child be older than this and have never attempted to walk, careful examination should be made as to the reason of the delay. Up to the sixteenth or twentieth month by far the most common cause of inability to walk is rickets, so that our attention is first directed to a search for the signs of this disease. Failing these we next carefully examine the nervous and locomotory systems, especially for evidence of birth paralyses, acute anterior poliomyelitis, and the hereditary dystrophies, which are the usual nervous lesions leading to want of power of progression. The possibility of syphilitic epiphysitis and scorbutus must be remembered.

After the child has begun to walk the gait may be so obviously abnormal as to attract notice at the general examination.

A tottering gait is common in rickets, after severe illness, and when the child is not thriving well; it may also be present in an infant which is quite healthy but lacks confidence. Limping is seen in many conditions. Thus a sore on the foot, an enlarged gland in the groin, any inflammation of the bones or joints of one limb, and especially hip-disease, rheumatic pains in the legs, or injury, may lead to it. It may also be caused by club-foot, and various forms of monoplegia. In some cases it is caused reflexly by preputial adhesions, with or without some inflammation from retention of the secretions. A waddling gait is seen in congenital hip-disease and in rickets with lordosis. In both these conditions the appearance of the child is very similar to that in pseudohypertrophic paralysis, but in the first the abnormal position of the great trochanters shows the exact state of matters; in the second there are other signs of rickets and the head of the femur is in its normal position, while in pseudohypertrophic paralysis the distribution of the affection of the muscles, the mode of rising from the ground, and the history, are the chief means of diagnosis. In children suffering from knock-knee and bow-legs the gait is also somewhat waddling.

A paralytic gait is seen in infantile paralysis, in some forms of muscular dystrophy, and in peripheral neuritis. In the last-named there is also foot-drop. A spastic gait is found in infantile cerebral palsy and in the paresis of spinal caries. Ataxia is not uncommon in children. It occurs in peripheral neuritis, especially in the form following diphtheria; here it is usually mild, and associated with it we find a loss of the knee jerks, and generally symptoms of past or present paralysis of the palate and eye muscles. An ataxic gait also occurs in Friedreich's disease; in this it is often combined with tremors and choreiform movements. Ataxia of a more reeling character is met with in cerebellar tumours.

When a great part of one leg is paralysed, as in some cases of infantile paralysis. the whole limb is moved forwards from the hip. A peculiar swinging gait is thus produced.

Other Characteristic Appearances.—The size of the child may attract attention. Thus cretins, in addition to having the characteristic facies, are extremely small for their age, and idiots generally are usually undersized. Short stature may also be due to various deformities and diseases of the spinal column, and is a common result of bad hygienic surroundings and deficient food. Achondroplasia is shown by a particular form of dwarfing—the trunk is fully developed, while the limbs are extremely short and the base of the skull contracted. On the other hand, oversized children are not necessarily healthy; in the early stage of rickets the patient is often a large child, but as age advances his growth remains slow, so that he at length falls behind the healthy child.

There may be a lack of due proportion between different parts of the body. Thus in tubercular peritonitis and in chronic abdominal disease generally, the large swollen belly contrasts markedly with the emaciation of the rest of the body. The size of the head may be disproportionate. After the third year its circumference should not be greater than that of the chest. The common form of disproportion is for the head to be relatively too large, as is seen in rickets, and more distinctly in hydrocephalus. In cases where the body is small and wasted, the head, although not of abnormal size, may appear to be so. Occasionally, as in microcephaly, the head is abnormally small; this is also seen in many other forms of idiocy, and may be associated with other of the so-called stigmata of degeneration. The more common of these stigmata are alterations in the size of the skull, facial or other asymmetry, deformities of the ears, imperfect development of the teeth, supernumerary teeth, highly arched "Gothic" palate, and deformity of the alveolar processes.

Congenital deformities should be carefully noted; they are often associated with each other and with various nervous affections. Thus club-hand, club-foot, genu recurvatum, spina bifida, meningocele, encephalocele, hare-lip, cleft palate, persistent branchial clefts, supernumerary digits, and various other imperfections may be found. Deformities may also be brought about by disease. Examples of these are curvature of the spine and deformities following bone and joint disease and fractures.

The position assumed by certain parts of the body may at times be suggestive of the patient's malady. Thus in rickets the limbs are found in positions in which the healthy child could never place them; this results from the presence of a very lax condition of the ligaments. Abnormal positions of various parts of the body may also be caused by paralysis or contracture of groups of muscles. Certain forms of club-foot and wry neck are dependent on such conditions. In many cases of infantile cerebral paralysis and Pott's disease there is loss of power in both lower extremities, and at times contracture also, while in acute anterior poliomyelitis the immobility is limited to a limb or a part of a limb, and is associated with deficient growth of the tissues. Absence of movement in a limb is often the result of a nervous lesion; it may, however, be due to the fact that movement is painful. In such cases we always think of the possibility of rickets, infantile scurvy (of which this is an important symptom), fracture of the bone or other trauma, joint disease, syphilitic epiphysitis, acute osteomyelitis, &c. Although common in childhood, rheumatism very rarely leads to want of movement in a limb. Various involuntary movements on the part of the child may attract attention early in the examination. The jerky, arhythmic, purposeless movements of chorea are very typical, and at once show the lines along which further examination should be made. The sudden movement of habit spasm, athetosis, and tremor, &c., should be noticed at the general examination, and more carefully observed when the nervous system is being investigated.

Various diseases are attended by complex semi-involuntary actions, and the recognition of these will often point in the direction of a diagnosis. The persistent scratching of the body in cases of pediculosis, and the pulling at the prepuce in cases of stone and other affections of the genito-urinary tract are examples of these. In laryngeal stenosis the child sometimes clutches violently at the throat, or introduces its fingers into the mouth as if to remove the obstruction. Before the spasm of whooping-cough the patient runs to catch hold of some fixed object for support, and during the attack may thrust the fingers into the throat so as to induce vomiting and relieve the seizure. Picking at the nose is popularly believed to be a sign of worms; it is a very common habit. Picking at the lips is seen in acute cerebral disease. Oxyurides lead to such irritation as to induce the patient to be constantly scratching at the anus. In short, many diseases express themselves in some more or less characteristic manner.

Clubbing of the fingers is less frequently seen in children than in adults. In congenital heart disease, however, it is almost always present, and if there be much cyanosis it is usually very marked. Long standing empyema and phthisis may also lead to clubbing of the fingers.

IV. GENERAL STATE OF NUTRITION.

The healthy child has a delicate pink colour, its body and limbs are rounded in outline; the skin is soft, smooth, elastic, and faintly moist, and the muscles are fairly resistant to pressure. Any interference with digestion or metabolism very rapidly leads to an alteration in the appearance of the child. This altered aspect, and especially the rapid disappearance of the subcutaneous fat, is one of the most striking features of acute disease in the infant. More particularly is this the case in the various derangements of the gastro-intestinal tract to which artificially fed children are so liable. With the disappearance of the fat the skin becomes wrinkled and inelastic and can be lifted up in folds from the tissues beneath, and in a remarkably short time the muscles become small and soft. When interference with nutrition has lasted a little longer the limbs become thin, the wrinkling of the skin becomes more marked and is especially noticeable about the groins, buttocks, and axillæ, the skin becomes harsh, and often dry and scaly, and the hairs become longer. The face is thin, the nasolabial folds are very distinct, and the outline of the sucking pads (which do not suffer along with the general fat) stands clearly out.

The commoner causes of such a train of appearances are acute febrile diseases, chronic gastro-intestinal catarrh, whooping-cough, acute rheumatism, abdominal tuberculosis, tubercular meningitis, and (occasionally) worms. In some cases of marasmus the disappearance of the subcutaneous tissues goes on to such an extent that the patient is literally nothing more than a skeleton covered with skin.

On the other hand, a fat child with moist elastic skin is not necessarily a healthy one. It has long been known that children who are receiving too large a quantity of carbohydrates, and notably children fed upon artificial foods, become heavy although they are often anæmic. They have soft muscles, and may suffer from severe rickets at a little later period. Indeed, children of this type, who to the untrained eye may have seemed particularly healthy, and have gained prizes at baby-shows, show a remarkable want of power of resistance to disease, and may succumb to affections by no means dangerous to the ordinary child. In the early stages of pseudo-hypertrophic paralysis there is also a deceptive appearance of great muscular development. But in this case the weakness of the muscles is easily seen in the unsteady gait and the characteristic mode of rising from the ground. In the later stage of the disease the muscles are atrophied.

OBSERVATION OF THE TEMPERATURE.

In the child the temperature cannot be satisfactorily taken in the axilla because it is practically impossible to keep the skin surfaces properly apposed for a sufficient period. The rectal temperature gives the most accurate results, but in many cases there are obvious objections to it. The thermometer is, therefore, usually placed in the groin and the leg held in the flexed position. Though not absolutely essential, a half-minute thermometer is a great assistance.

The normal temperature is much more variable than in the adult, and during the first two years anything between 98° and 99·5° F., may be regarded as within the limits of health. Normally, the temperature varies to a considerable extent with the time of day, and usually reaches its maximum about 8 to 10 a.m. There are generally several rises and falls in the twenty-four hours—a sign of that instability of the nervous system so important a factor in all the events of childhood. In disease the temperature is, as a rule, higher in the evening than in the morning, and if in any febrile condition the morning temperature is found to be distinctly higher than the evening one, it is of rather unfavourable augury. In fever as well as in health there is more instability than in after life; thus in the second week of typhoid the remissions are much greater than in the adult, hence the name, "infantile remittent fever." In croupous pneumonia the temperature does not show that comparatively steady course to which we are accustomed, but is marked by distinct remissions, and during the few days immediately succeeding the crisis there are usually several rises before a steady normal is reached.

As the nervous mechanism connected with the regulation of the temperature in the child is so readily upset, a febrile condition is of less importance than at a later period. Comparatively little is required—a trifling derangement of the stomach is sufficient—to give rise to a temperature which in the adult would be rather alarming. In disease generally, the amount of fever is of much less importance, both as regards prognosis and treatment, than when we are dealing with a grown-up patient. Indeed, the inference from the temperature is often almost the opposite of what it would be in the adult. For example, with signs of considerable involvement of the lungs, or with the presence of membrane in the throat, a low temperature is rather a source of anxiety than of satisfaction, pointing as it does to collapse and the failure of the organism to react to stimulation. So, too, in cases where there is some difficulty in diagnosing between diphtheria and follicular tonsillitis; in the latter and less serious of these the temperature is usually higher than in the former and more dangerous. In tubercular meningitis the temperature is not, as a rule, very much raised until the last few hours of life, when it may rush up to 107° or 108,° and even rise higher after death. Such an extreme terminal rise of temperature is also seen in some forms of blood disease in children, and in sundry other conditions.

The commoner causes of very rapid and excessive rises of temperature in the child are gastro-intestinal derangements, scarlet fever, acute throat affections, and otitis media.

A distinctly subnormal temperature is usually of very bad omen. In the newly born it is seen in asphyxia, atelectasis, &c. A sudden fall of temperature in a case of broncho-pneumonia is a serious sign; it may indicate a dangerous failure of the nervous system to react to the local lesion; more commonly it points to the onset of collapse of a large area of lung tissue. A subnormal temperature is also seen in the collapse stage of choleraic diarrhœa, and to a less extent after severe diarrhœa generally. After burns and serious operations, and in many other conditions, a subnormal temperature will give rise to the gravest apprehension on the part of the physician.

EXAMINATION OF THE SKIN AND SUBCUTANEOUS TISSUES.

In considering the physical examination of the skin, we may approach the subject in the following order:—I. Colour; II. Moisture; III. Œdema; IV. Emphysema; V. Scars, &c.; VI. Skin Eruptions.

I. COLOUR.

1. **Pallor.**—Some children, although quite healthy, have naturally pale complexions; others, although anæmic, have a bright and florid colour. Speaking broadly, the mucous membranes are a better guide than the skin to the amount of hæmoglobin in the blood. It must be remembered that simple inspection is a somewhat uncertain means of estimating the degree of anæmia present, and that children are often less bloodless than they appear to be. The pallor may be of some peculiar tint; thus we may see a lemon or waxy paleness. The diagnostic value of these may easily be overrated. The typical greenish tinge of the chlorotic is practically never found at the period of life under consideration.

In asphyxia pallida, abnormal paleness of the skin is a prominent feature; apart from this, pallor is met with in much the same conditions as in the adult. If temporary, it may be due to faintness, excessive cold, nausea, or collapse; permanent pallor results from the various diseases attended by anæmia, and of these we may especially mention rickets, congenital syphilis, diarrhœa, and waxy disease.

2. **Excessive Redness.**—This is seen in the general hyperæmia of the newly born, and in the flushing which attends the pyrexia of febrile diseases. It is typically present in the various forms of erythema to be mentioned later. Local flushings are common physiologically, especially in nervous children. In disease they occur in tuberculosis, particularly if the lung or meninges be involved. In tubercular meningitis *tâches cérébrales* are very frequently present; they are transient local flushings caused by pressure upon, or irritation of the skin, and are due to the affection of the vaso-motor centre. They may be seen in many diseases other than meningitis, and are of little diagnostic value. The hectic flush of phthisis, and the flushed cheek of scarlet fever and typhoid are well recognised. In pneumonia one side of the face is often noticed to be reddened; this has been said to indicate which lung is affected. It is probably often accidental, and due to the child lying on its side.

3. **Cyanosis** is marked in all conditions leading to defective aëration or to stagnation of the blood. According to its cause it may be temporary or permanent. It is seen typically in some cases of congenital heart disease, and gives to these a name—Morbus cœruleus. In this condition the whole surface of the body has a leaden bluish tinge, and, as in other conditions of general stasis, clubbing of the fingers is often conjoined with the cyanosis.

In laryngeal obstruction from croup, retro-pharyngeal abscess, foreign bodies, &c.; in enlargement of the bronchial glands, in adenoids, in the rhinitis of young children, in atelectasis, and in asphyxia livida; in whooping-cough and in convulsions, temporary or permanent cyanosis is observed. In bronchitis its severity may be taken as an index of the extent to which the air passages are involved; in broncho-pneumonia, simple or tubercular, it is proportionate to the amount of lung affected. In chronic heart disease, in acute miliary tuberculosis, and in emphysema (which is less rare than is often believed), cyanosis is sometimes a prominent symptom.

The sudden development of, or increase in an already existing, cyanosis in the course of any pulmonary affection, is highly suggestive of the sudden loss of function of an extensive area of lung tissue. The chief cause of this, and that which we are inclined, especially in young infants, to suspect, is atelectasis—collapse of the lung. Unless some complication, such as ascites, exists, cyanosis is not a marked feature of pleural effusion. In simple croupous pneumonia it is usually absent.

Local cyanosis is seen in exhaustion and in collapse from acute or chronic disease. The dependent parts and extremities are most affected. As typical instances of this, œdema and sclerema neonatorum may be cited. During the first few days of life, if the child be at all feeble, there is often slight cyanosis round about the mouth. It is not necessarily a serious sign.

4. **Icterus** is very common in the newly born and is usually physiological (idiopathic icterus). It may also be due to congenital obliteration of the bile-ducts, to syphilis of the liver, or, in rarer instances, to septic infection or other cause. Icterus is now believed to be always hepatogenous, never hæmatogenous, in origin. The existence of the following four forms of jaundice must always be borne in mind :—(1) **Icterus Neonatorum.**—The absence of general symptoms, the slight affection of the sclerotics, the yellow colour of the fæces, and the early onset are sufficiently distinctive. (2) **Congenital obliteration of the bile-ducts.** Here the diagnosis depends chiefly upon the course, the pale colour of the fæces, and the steady increase of the jaundice. (3) In **syphilitic icterus** we have to rely upon the history and the presence of other signs of constitutional disease. (4) In **septic conditions** the jaundice is overshadowed by the severity of the general toxæmia. The error which is most likely to be committed is that of neglecting to consider the possibility of a case being anything else than idiopathic icterus.

In later childhood all the probabilities are in favour of a catarrh of the bile passages being the cause of icterus. Cirrhosis of the liver is sometimes met with, but many of the commoner causes of jaundice in the adult, such as gall-stones and cancer, are practically excluded by the age of the patient.

5. **Discolouration of the Skin.**—This occurs in much the same conditions as in the adult. A brownish mottling, seen especially over the front of the shin, is often present in children with a poor circulation who have been in the habit of sitting much over the fire. In tuberculosis there is some tendency to abnormal darkening of the surface of the body. This is occasionally well seen about the scrotum and perineum.

II. MOISTURE OF THE SKIN.

Comparative dryness of the skin is the rule in infancy; indeed, in very young babies there is no secretion of sweat. In certain diseases attended in the adult by excessive sweating, the symptom is absent when they occur in the child. Of such diseases, acute rheumatism is an excellent example. General excessive perspiration is due (1) in most cases simply to overheating, as by unnecessarily warm wraps and coverings, by poulticing, &c.; (2) in weakly infants, to feebleness; (3) to rickets; here it is especially marked about the head; (4) to various spasmodic disorders, such as laryngismus and colic; in the latter, a crop of sudamina or small pink papules is often seen over the skin of the abdomen, and is the evidence of an outbreak of sweating succeeding an attack of pain; (5) to chronic febrile diseases, especially tuberculosis; (6) to dyspnœa. Local sweating is not infrequent in meningitis and in one or two other nervous disturbances. Sweating about the head is, in older children, often associated with long hair. In acute rheumatism, as has been already stated, perspiration is not very profuse, nor is it a prominent accompaniment of the crisis of a fever.

A defective secretion of sweat is met with in Bright's disease, diarrhœa, diabetes, fevers, and some skin diseases, such as ichthyosis. In tuberculosis, so long as the temperature remains normal, there is usually no great amount of perspiration.

III. ŒDEMA.

Œdema is liable to occur in infancy upon somewhat slight provocation. It is firm and pits less readily on pressure than it does in later life. For this reason the name "œdema lignea" is sometimes applied to it. The causes leading to its production are much the same as in the adult, though for various reasons they may be less easily discoverable. Of all causes, nephritis is one of the commonest; many cases of œdema, and even of œdema neonatorum, are due to renal disease. There is often difficulty in getting a sample of the urine; it can seldom be obtained regularly, and at times, even in the case of acute nephritis, albumin, casts, and blood may be absent. Next in frequency to kidney disease, we have as a cause of œdema a weak state of the circulation. This may induce extensive œdema neonatorum involving the whole of the lower extremities. More often, however, it is manifested by a slight puffiness of the backs of the hands and feet. Œdema of the limbs is seen along with paralysis, and, here again affecting the dorsa of the hands and feet, in tetany. Some cases of uni- or bi-lateral œdema persist during life; they are probably due to some malformation of the lymphatic vessels.

Œdema of the face is extremely common in childhood, and is due to very various conditions. Of its more general causes we may note anæmia, kidney disease, marasmus, and heart disease; but it also arises under other circumstances. Its principal causes and varieties are as follows:—(1) Carious teeth. (2) Whooping-cough. Here the eyes are puffy and the face somewhat dusky; pitting on pressure is usually absent. (3) Giant urticaria, angio-neurotic œdema, and, allied to this, local œdema about the eye where no ocular inflammation is present. (4) Quite analogous to the œdema from whooping-cough is that due to the pressure of glands, &c., on venous trunks. To facial œdema caused by the cicatrices of broken down caseating glands, the name of "Hutchinson's œdema" is given. (5) A post-erysipelatous form also occurs. It will be seen that these varieties form a somewhat perplexing series of cases, and it must be admitted that it is often difficult, if not impossible, to discover the cause of the condition.

IV. SUBCUTANEOUS EMPHYSEMA.

Subcutaneous emphysema is rare. It results most frequently from rupture of some alveoli of the lung during the paroxysms of whooping-cough ; it may also occur during aspiration of the chest, as well as round tracheotomy and other wounds, such as those of the operation for empyema. Fracture of a rib, one of the commonest causes of surgical emphysema, is an injury to which the child is but little liable.

V. CICATRICES AND SCARS.

The vaccination scar has sometimes to be inspected ; it should be thin and foveated, and of not less than one square inch in area. The amount of protection is believed to be proportionate to the extent of the cicatrix. Tubercular scars are chiefly seen in the neighbourhood of the glands of the neck and about joints ; they are often puckered and retracted, and adherent to the subjacent tissues. Small circular depressed cicatrices sometimes follow chicken-pox. They are not numerous, only one or two pustules being, as a rule, sufficiently severe to leave a scar. The cicatrices of burns are common, and need but a passing mention. The eruption of syphilis is seldom of such a nature as to produce scarring.

VI. CUTANEOUS ERUPTIONS, INCLUDING DISEASES OF THE SKIN.

It is impossible to learn the art of diagnosing skin affections except by the examination of cases. In this section, therefore, we can do little more than enumerate the diseases and appearances which are most liable to be met with, and in some cases indicate their chief points of distinction.

The arrangement which we have adopted is an entirely arbitrary one, and, in many instances, cross-classification could not be avoided. It is hoped, however, that it may in some degree assist the reader in determining the probable nature of the cases he may meet with.

When we are told that a child is suffering from a rash we should ask the following questions :—How long has it been out ? Did it come out suddenly or gradually ? Where did it first appear ? Is it itchy, and if so, when is the itchiness worst ? Is it painful ? Are other members of the family affected ? Has the child shown any constitutional symptoms ? It must be remembered that in the rashes of the exanthemata, as well as in those occurring in certain other constitutional conditions, the opinion which we form rests to some extent upon the presence or absence of general symptoms and signs. In judging of the nature of an eruption two rules should be attended to :—(1) Always examine the whole body ; (2) endeavour if possible to see the skin in good daylight before giving a definite diagnosis.

1. Erythematous and Macular Eruptions.

One of the most important groups to be considered under this head is that of the exanthemata.

The rash of **scarlet fever** consists of a diffused red blush which has been likened to that caused by the application of a mustard leaf. It appears on the second day of the disease, beginning upon the neck and chest, and spreading downwards over the body, covering it in from thirty-six to forty-eight or fifty-six hours. After lasting for from three to five or seven days, the rash fades in the order in which it appeared. The face is almost always spared; the cheeks are, however, flushed, but the area of skin round the mouth remains pale. At first the rash consists of a number of minute, closely set, red points (the papillæ) with pale interlying skin. These points soon coalesce and give rise to a uniform redness, though towards some part of the margins of the eruption the punctate appearance can generally be made out. The skin feels hot and pungent, and the pressure of the hand gives rise to temporary blanching which contrasts markedly with the surrounding congestion. The eruption is best seen (and in doubtful cases should be looked for) in the creases of the elbows, knees, and axillæ, as well as over the back and buttocks. In about ten days after the disappearance of the rash desquamation begins. It is first observed as a fine branny scaliness in the region of the neck and clavicles, but as the process goes on large sheets of epidermis may peel off the abdomen, limbs, palms of the hands, and soles. Desquamation is rarely complete before the expiry of seven or eight weeks.

The conditions which are most likely to give rise to difficulty in the diagnosis are:—(1) Some cases of German measles. (2) Temporary erythema, seen in all forms of septic infection, as in absorption from burns. (3) Belladonna and other drug rashes. The chief distinguishing features of scarlet fever are the sore throat, vomiting, high temperature, and rapid pulse. At times, however, these are but little marked. The distinctive features of German measles will be mentioned in treating of the eruption of that disease. In septic rashes we always find some focus of infection, very often an unhealthy wound or a suppurating surface. Such eruptions may, for example, be seen in cases of burns, and even in purulent vaginitis. The eruption often exactly simulates that of scarlatina, but seldom or never pursues so definite a course. It comes out in irregular patches, or over the whole of the body at one time, and may disappear and re-appear at intervals. These features may to some extent be presented by anomalous cases of scarlet fever, but are not common. There is very often a considerable rise of temperature with the appearance of the rash of sepsis. Allied to the preceding are the rashes sometimes seen in diphtheria. A very puzzling condition, and one which is possibly analogous to this, is the scarlatiniform eruption which occasionally occurs along with tonsillitis and pharyngitis. It is necessary to mention this in order that the student may be on his guard. The eruption caused by atropine is scarlatiniform, and may be unassociated with other symptoms of poisoning, though some dilatation of the pupils, or dryness of the fauces, will usually be found. These, along with a history of the use of the drug, either internally or as an eye lotion, are sufficient to lead to a correct diagnosis. Other drugs, of which chloral, antipyrin and its allies, and the balsams are the most important, may give rise to a similar eruption. In the case of the last-mentioned substances, however, the rash is more commonly measly. The application of carbolic lotion often causes an erythema extending beyond the limits of its local action.

It will be noted that no mention has been made of desquamation as a diagnostic feature. The position of affairs is this: desquamation is evidence of intense cutaneous hyperæmia which may, or may not, be due to scarlet fever. When, to establish the diagnosis, the only evidence required is that of a pre-existent rash, the occurrence of peeling is of great diagnostic value. On the other hand, if an intense rash has actually been *seen*, but has been of such a nature as to leave the observer in doubt as to the diagnosis, it will almost certainly give rise to desquamation whether the case has been one of scarlet fever or not, hence the ambiguity of the sign. In spite, however, of all that has been said in the preceding paragraphs, it should be borne in mind that the majority of cases in which the eruption resembles that of scarlet fever, and in which, after sufficiently careful examination, no other reason for its occurrence can be found, ultimately turn out to be scarlet fever. In other words, in doubtful cases the arithmetical probability is in favour of this disease, with the proviso that second and third attacks of fever are not very common, and that the disease is extremely rare in children under a year old.

The eruption of **measles** comes out on the third, or, less frequently, on the fourth or fifth day. It may be observed somewhat earlier upon the conjunctivæ or palatal mucous membrane. It appears upon the forehead near the roots of the hair and over the mastoid processes; it spreads over the face and covers the whole body within from 24 to 72 hours. The eruption consists of dusky red blotches or patches of about $\frac{1}{6}$ inch in diameter. They are smooth and slightly raised, and are scattered pretty uniformly over the surface of the body, although, especially on the face, they tend to assume a somewhat crescentic arrangement or to coalesce. After remaining for a few days the rash fades, and is followed by a slight branny desquamation. The constitutional symptoms—the cough, sneezing, and lachrymation—are nearly always well marked. The only conditions with which measles is likely to be confused are:—(1) German measles. (2) Some forms of rheumatic erythema. (3) Copaiba and antipyrin eruptions. Measly rheumatic rashes are usually near joints, and often affect the extensor rather than the flexor aspect of the limb; they may disappear and re-appear, and are generally associated with other constitutional symptoms. The diagnosis is occasionally extremely difficult.

It is not easy to give a sufficiently clear description of the rash of **German measles** to enable the reader fully to grasp its characters as opposed to those of the eruptions of the two preceding fevers. It is much less constant than are the rashes of measles and scarlatina, and lies in some respects intermediate between them. When, however, a few cases of German measles have been seen, there is little difficulty in recognising others as they present themselves. The eruption resembles that of scarlet fever in its colour and date of appearance: it resembles that of measles in its character and distribution. It comes out, therefore, on the second day, and consists of bright scarlet blotches appearing upon the face and rapidly extending over the body. Typically, it consists of a crop of small pink macules, each about the size of a pin's head, developing upon the face, scalp, neck, and trunk, as a rule discrete, but in places coalescent. If the spots be large and isolated from each other, the rash resembles that of measles; if small and closely set, it is more likely to be mistaken for scarlet fever. The chief points upon which a diagnosis rests, are the characters of the rash as described above, the mildness of the initial symptoms, and the enlargement of the posterior cervical and sub-occipital glands. Whilst this sign is practically constant, we must, in order to place reliance upon it, exclude other causes of adenitis, and remember that a slight degree of tenderness and enlargement of all the palpable glands of the body is common in scarlet fever.

Although not strictly belonging to the group of the erythemata, the rashes of some of the other eruptive fevers may be disposed of here.

The rash of **chicken-pox** appears without premonitory symptoms on the first day of the illness. When first seen it consists of a crop of small papules rather sparsely scattered over the body and scalp, and also affecting the palatal mucous membrane. The papules quickly become vesicular and then pustular, and as they appear in successive crops from the first to the third day, we usually find papules, vesicles, and pustules simultaneously upon the skin. Their number varies from 20 or 30 to 300 or more. It is generally stated that the pustules are not umbilicated; while this holds good for the majority, it is not an absolute rule; careful search almost always reveals some in which distinct umbilication exists. As the pustules dry they form crusts, most of which eventually fall off without leaving any scars; some lead to excoriations, especially if they have been subjected to much irritation; a few severe pustules lead to cicatrisation. Chicken-pox is easily recognised: the only disease with which it is liable to be confounded is smallpox. In children with efficient vaccination marks the latter may almost certainly be excluded. Modified smallpox often bears so close a resemblance to chicken-pox that the performance of vaccination may be needed to throw light upon the case.

In **enteric fever** the characteristic roseola is an even less constant symptom in the child than in the adult.

The rash of **erysipelas** is a typical erythema, though in some instances other cutaneous lesions are added. Possibly various transient and irregular forms of erysipelas are closely allied to the septic rashes described in connection with the exanthem of scarlatina.

Erythema multiforme is very common in childhood, and is most frequently seen in the form of annular and gyrate erythema; these may, in most instances, be regarded as an evidence of the rheumatic diathesis. Typically, it develops suddenly in the forms mentioned, upon the trunk and extremities, and spreads marginally. The spots, which somewhat resemble the rash of measles, occur most commonly in the course of some other disease (such as chorea or endocarditis) indicative of the rheumatic constitution, and when they are seen, subcutaneous nodules should be sought for. At times the occurrence of exudation gives to the eruption an appearance not unlike urticaria, but the itching is less, and the rash more persistent. So far as our experience goes, vesicles and bullæ are not common. A special variety, and one very characteristic of rheumatism, is what is known as **erythema nodosum.** It appears over the tibiæ, and sometimes on the thighs and arms, in the form of raised, reddish, satiny patches, tender to the touch, and accompanied by feverishness and constitutional disturbance. The patches are of variable dimensions, from the size of a shilling to that of a crown-piece; they remain for about a week, and as they disappear go through the same series of alterations in colour as does a bruise. The only condition for which erythema nodosum is likely to be mistaken is acute periostitis; a little attention will, however, in most cases prevent such an error being made.

Urticaria is not uncommonly met with; it is sometimes of rheumatic origin. Very often we have only the history of its occurrence to guide us, and in such cases the presence of marks of scratching may aid the diagnosis. It must at the same time be remembered, that in a certain number of persons scratching will produce urticaria; wheals are common in such irritable skin affections as scabies. In addition to enquiring for a history of rheumatism, we make particular investigation as to the diet in cases of suspected urticaria. If prolonged, the disease is one of the most frequent causes of prurigo, which will be considered under the head of papular skin affections.

A macular eruption, often chiefly distributed over the extremities and face, or actually limited to these parts, of a rather dull reddish colour, and frequently associated with a rash of some other type, is usually due to **congenital syphilis**; when it is seen other signs of this disease must be looked for. In addition to this eruption, it is not uncommon to meet with a somewhat characteristic condition of the palms and soles in syphilis. The skin is deep red, extremely glossy, and tends to desquamate. This is chiefly found in quite young infants, and is probably a minor degree of the change which in severer cases leads to pemphigus.

Of the purely local erythemata **intertrigo** is by far the commonest. It affects principally the perineum, groins, and adjacent parts, and is almost invariably due to lack of cleanliness, and to the diarrhœa produced by the incorrect feeding which so commonly goes hand in hand therewith. Very often, in addition to the simple hyperæmia of intertrigo, we have an eczematous condition with superficial excoriations, or even, in severe cases, deep clean-cut ulcers covered with a greyish membrane. Intertrigo often complicates syphilis, but must not by itself be taken as evidence of that disease.

Another local erythema is that caused by cold—the ordinary **chilblain.** It is found chiefly upon the fingers, toes, and ears, is intensely itchy, and, like the preceding, may go on to ulceration, or even, especially if the ears be involved, to well marked loss of tissue.

The most important **drug eruptions** which are liable to occur in children, and whose greatest interest is from a diagnostic point of view, are those of belladonna, antipyrin and its allies, chloral, and the gum-resins. The rashes of the first and third are usually scarlatiniform; of the others, measly.

2. PAPULAR ERUPTIONS.

In young infants we not infrequently find a widely distributed crop of small red acuminate papules, possibly surmounted here and there by tiny vesicles. To this, which is often associated with gastro-intestinal disorder, or with excessive sweating, the name of **lichen strophulus** or "red gum" is given; more popularly, it is known as "the hives." A very important skin affection of young children falls to be noticed in this group; it consists of a crop of closely set, pale coloured papules found most abundantly upon the outer aspects of the legs and extensor surfaces of the arms, or, in more marked cases, spreading over the whole body. In children under a year the papules are usually scanty in number, and their place is to some extent taken by wheals, from which the papules are believed to develop. This condition forms one of the group of skin affections included under the term **prurigo,** and is more specifically named **lichen urticatus** or **urticaria papulosa** As its generic name implies, it is intensely itchy; consequently, the lesions of scratching are usually added, the children are below par, and the skin generally is harsh and unhealthy-looking. The name **lichen pilaris** is given to the small hard papules so often seen round the hair follicles on the outer sides of the arms and legs.

True lichen planus may also occur in childhood, and papules are common in cases of eczema. The eruption of **syphilis** is very frequently papular, it has the usual characters, and is often most copious upon the hands and face. Papules on mucous membranes, or on apposed skin surfaces, give rise to mucous patches and condylomata. An appearance almost exactly simulating the latter may be seen in tinea circinata if subjected to similar conditions, as for example when the spot appears upon the buttocks close to the anus, this, however, rarely leads to difficulty, as its occurrence is uncommon and purely accidental.

The papular stage of varicella has been already alluded to.

3. HÆMORRHAGIC ERUPTIONS.

The most common of these is the petechial eruption due to the bites of fleas. The whole body is sometimes covered with these minute purple specks. Like other hæmorrhagic rashes they do not disappear on pressure, and recent bites are surrounded by a zone of erythema.

Purpura exists either as a symptom of a general disease, or as an affection apparently *sui generis*. Of the latter, three forms are described :—**Purpura simplex; Purpura hæmorrhagica,** in which hæmorrhages take place from other organs of the body; and **Purpura fulminans,** a severe fatal form first described by Henoch, where, without visceral bleedings, the cutaneous hæmorrhages are so enormous and acute in their course as likely to prove fatal. In every case of purpuric eruption a careful examination of the blood should be carried out, both as regards the enumeration of the corpuscles, and their appearance in stained films. Before we are entitled to look upon a case as idiopathic purpura we must have excluded the constitutional diseases in which hæmorrhage may occur. The most important of these are :—(1) **Rheumatism.** Purpura is here most commonly seen as a group of spots in the neighbourhood of a joint; to this the name of peliosis rheumatica has been applied. Further, it may occur as a complication of erythema, and especially of erythema nodosum. (2) **Septic diseases.** The heart must be carefully auscultated, and should even an impurity in the sounds be detected, this, along with extensive purpura, points in the direction of ulcerative endocarditis, either independently of, or, as is more frequently the case, complicating rheumatism. (3) **Anæmia** and **leucocythæmia,** especially the acute forms of the latter. (4) **Hæmorrhagic diseases,** such as scorbutus, hæmophilia, and the hæmorrhagic diathesis of infancy. (5) **Infectious diseases,** in particular measles and small-pox. (6) Minute petechiæ occur after the spasms of **epilepsy** and **whooping-cough.** (7) Other conditions, such as **nephritis** and **malaria,** and the excessive use of iodide of potash or chlorate of potash, or an idiosyncrasy as regards the actions of these drugs.

4. SCALY ERUPTIONS.

These are, especially about the head and face, very common.

Seborrhœa of the scalp is an extremely frequent, and in slight degrees almost physiological condition in young infants. The anterior fontanelle and its neighbourhood is a favourite site for the appearance of yellowish-brown flakes, or, in ill-cared for children, thick crusts, with excoriation of the surrounding skin. The scales are due to the persistence of vernix caseosa, or to the collection of the secretion of the active sebaceous glands of the part. Seborrhœa is also seen as one of the forms of dandruff; the scalp is more or less covered with yellowish greasy scales, the skin is reddened, and very often eczema is superadded.

Ring-worm of the scalp can usually be easily recognised by the presence of partially bald circular patches covered with fine greyish white scales, among which the characteristic cracked and broken stubbly hairs are to be seen. Underneath the scales the scalp is often slightly reddened, and in some cases severer inflammation, either spontaneous or the result of irritating applications, may ensue. At times the ring-worm is disseminated, and here the diagnosis is more difficult, but attention to the following points may be of assistance:—the presence of ring-worm in other members of the family; the discovery of the typical stubbly hairs; and the chloroform test. To carry out this test a little chloroform is sprinkled upon the affected scalp, or upon suspected hairs. As it evaporates a white colour is left should the case be one of ring-worm; if the case be not ring-worm no change of colour takes place. The identification of the parasite is conclusive evidence of the presence of the disease. Without referring more particularly to the method of examination, we may say that it is utterly useless, and a mere waste of time to examine any hairs save those short broken ones to which we have already directed attention. Ring-worm of the body is easily detected as soon as the characteristic rings have developed. Before this, however, while only small scaly papules are present, its recognition is difficult. The well-defined ring is pale in the centre, the margin is distinct, red, and scaly, or at times vesicular. The eruption is but slightly itchy. The presence of the scales, and the discovery in them of the parasite, are sufficient to distinguish tinea circinata from one disease which somewhat resembles it—viz., annular erythema.

Favus is more often seen as a crusted than as a scaly eruption, but may most conveniently be discussed along with the preceding. It is met with far most frequently upon the scalp, but may affect other parts of the body. It is characterised by the presence of sulphur yellow cups or crusts, circular if single, through the centres of which hairs project. Where the scales or crusts have fallen off, bald spots covered by tense glossy skin are seen. When extensive, a case of favus has a peculiar musty or mousy odour.

A skin disease which has some resemblance to ring-worm of the body must be briefly described. Though more frequent in children than in adults, **pityriasis rosea** is not a common affection in this country, and for this reason it is perhaps a little likely to be overlooked. It appears at first as a reddish spot on the trunk, this extends by marginal spread; the edges become slightly raised, while the centre looks as if depressed, and gradually becomes paler. A fine covering of whitish scales gives to the patch a rather fawn-coloured appearance. The first spot is succeeded by numerous others of varying size, they coalesce and give rise to a somewhat gyrate or marginate appearance. The eruption is usually limited to the covered parts of the body. The disease is probably due to some species of parasite. When only one spot has developed it rather closely resembles ring-worm, but is of a paler colour and less distinctly annular. When well marked the rash is easily recognised. Of **pityriasis versicolor** it is sufficient to say that it is extremely rare at this period of life.

A very important scaly condition of the skin is that which is present in **ichthyosis.** This is a by no means uncommon disease; it is generally congenital, occasionally acquired. It varies from the slightest degree of harshness of the skin with prominence of the hair follicles, up to the advanced form, where lozenge or diamond-shaped areas of skin are seen, surrounded and separated by deep furrows. The cuticle as a whole has a dirty appearance, is dry, and sweats little, if at all. The disease is often best seen on the outer aspects of the arms, about the folds of the axillæ, on the back, and on the legs. An analogous thickening of the skin of the palms and soles is known as **tylosis**; it is often hereditary.

Scaly eczema is less common than the pustular and crusted types; it is usually combined with them. Scaly syphilides are very frequently found in congenital syphilis. **Psoriasis** is rare in the young child. **Exfoliative dermatitis** has been several times described as occurring in the newly-born infant. The possibility of scaliness being due to the scarlet fever rash, or some other of the **exanthemata,** must also be recollected.

5. Vesicular Eruptions.

A crop of **sudamina** is a very common result of excessive sweating, and is seen, for example, in rickets or in colic. **Herpes** is often disfigured by scratching, but is usually easily recognisable. Herpes zoster is moderately frequent, and is unattended by the severe pain and itching so common in the zona of the adult. A crop of herpes (H. febrilis) may be seen on the lip in ordinary colds, in pneumonia, and in other infective conditions.

Small vesicles are at times seen in erysipelas, at the margin of a patch of tinea circinata, and in eczema; they also occur in the eruptions of chicken-pox and smallpox, and in the first stage of impetigo contagiosa. Large vesicles or bullæ may be found in erythema multiforme.

Large blebs distended with clear or milky contents, scattered irregularly over the body surface, are easily recognisable as **pemphigus**; if flaccid, containing purulent fluid, and situated only upon the palms and soles of a newly-born baby, they are absolutely pathognomonic of syphilis, and as such have great prognostic import: children thus affected invariably die. Among bullous eruptions, that due to **iodide** must be mentioned.

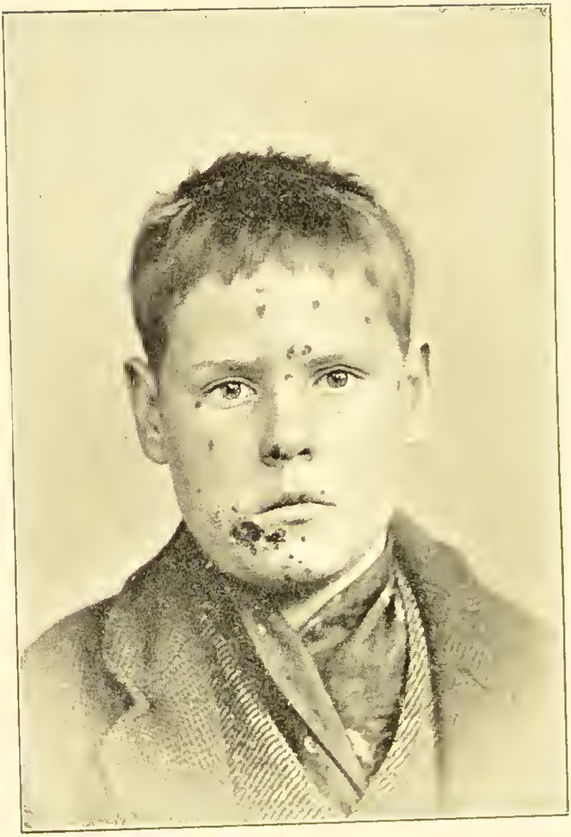


FIG. 7

IMPETIGO CONTAGIOSA

6. PUSTULAR AND CRUSTED ERUPTIONS.

These, particularly the latter, are very frequently met with. **Impetiginous eczema** is one of commonest of all the skin eruptions to which the child is liable. In marked cases, the whole face is covered with greenish, yellowish, or brownish scabs; where these are detached the excoriated and bleeding skin is seen, and from the raw surface a constant exudation of serum takes place; this rapidly dries and forms yellow scabs. In less marked cases, the crusts are small and confined to one or two localities, of which the ears, and the region of the mouth and chin, are perhaps the favourite. In the scalp, pediculosis is a very common accompaniment (or cause) of eczema.

A special form of crusted eruption chiefly affecting children is that known as **impetigo contagiosa.** It begins as a flattened vesicle whose contents rapidly become purulent, and, drying, form a scab, which, when removed, lays bare excoriated but not ulcerated skin. (Fig. 7). The face and scalp are principally affected; when the crusts have coalesced the condition resembles eczema. It is distinguished from this disease chiefly by the fact that the crusts of impetigo contagiosa are surrounded by healthy-looking skin, while in impetiginous eczema there is always a considerable zone of inflammation round them, and here too the glandular enlargement is much more marked. Crusts, pustules, and wheals are very often found in **scabies** in young children. In infants the favourite sites are the buttocks and loins, but the whole body may be covered. So much is the lesion obscured by scratching and by the chafing of the clothes that it is generally impossible to find typical burrows. As a rule, the mother or nurse is also affected, but, even apart from this, the diagnosis is not difficult when the distribution and multiform character of the rash are observed. In older children scabies has the usual characters. It not infrequently happens that cases are seen, in which, without any definite cause being discoverable, numerous sores in various stages of excoriation, suppuration, scabbing, and healing are seen, scattered over a more or less extensive area of the body surface. In these circumstances **auto-inoculation** by the scratching of some neglected abrasion is often to be regarded as the cause of the condition.

A very typical pustular eruption of the scalp is that complicating ring-worm and known as **kerion.** Numerous small pustules are seen, from which hairs matted by glutinous discharge protrude. The scalp feels tense and boggy, but there is no true cellulitis. Such a state of matters may arise spontaneously, or may result from the application of strong parasiticides, such as absolute phenol, &c. Pustules are seen as part of the eruption of smallpox and chicken-pox, and in acne. The possibility of **bromide acne** should not be forgotten when the disease is noticed in a child.

Crusts are found on the scalp in favus. Bromide crusts are chiefly seen about the face, and may remain for some weeks after the drug has been discontinued. They may leave behind a little scarring.

7. OTHER CUTANEOUS LESIONS.

Lupus vulgaris is comparatively rare in young children; the presence of the lupus nodule, which must be sought at the margin of the patch, is diagnostic in a doubtful case. **Alopecia areata** is common, and easily recognised. The bald patch, covered with smooth, soft, often downy skin, is quite typical. The tension of the scalp, and the presence or absence of silky hairs should be noted. There is often more than one spot of alopecia, or the condition may be generalised (Fig. 8). A general downy state of the skin is often met with in delicate children with a proclivity to tuberculosis.

Nævi, moles, and **warts** require but a passing mention. In regard to the first, it is of importance to discover whether or not they are increasing in size, and, if so, whether the growth is more rapid than that of the child. Small pedunculated tumours, from whose apices a milky fluid can be expressed, are characteristic of **molluscum contagiosum.** The region of the eyelids is a favourite site for its occurrence.

Abnormal hardness and density of the skin is met with in two conditions, which, partly no doubt from their similarity in name, have frequently been mistaken for each other. They are **sclerema neonatorum,** and **scleroderma.** In the former, the skin lesion is only one part of the general disease, of which an excessively low temperature is also a prominent symptom. The condition is limited to early infancy, and proves rapidly fatal. The skin of the legs is firm and dense, and as the process extends to the body the child becomes rigid and board-like. In scleroderma there is local infiltration of small areas of skin, which become dense, cartilaginous, and of an ivory whiteness. Scleroderma must not be mistaken for the infiltration met with in cases of chronic eczema.

Subcutaneous Nodules.—Of these it may be said that they are pathognomonic in the true sense of the word, and, as such, are worthy of special attention. So far as is known they occur only in acute and subacute rheumatism, and in no other disease. They appear suddenly in crops, usually upon successive days, and the sites for which they show a predilection are the knees, elbows, ankles, wrists, spine, scalp, and, generally, any localities where tendinous or aponeurotic structures exist. The nodules are often about the size of a pea, or a little larger or smaller: they are freely movable under the skin, which may be slightly reddened, but is more frequently of normal appearance. While in some cases the nodules persist for weeks, they may disappear earlier. They are quite easily recognised, especially if the hand be passed over the joints; a search for them ought never to be omitted in rheumatic cases, since their presence indicates that the system is saturated with the poison. The majority of patients in whom they occur do not arrive at maturity.

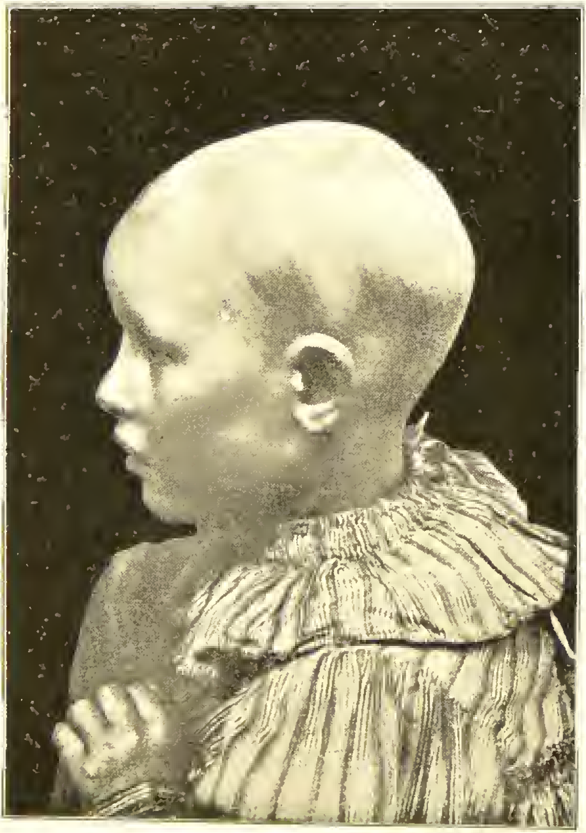


Fig. 8

TOTAL ALOPECIA OF SIX YEARS DURATION

We not uncommonly find subcutaneous **abscesses** developing either spontaneously or in connection with some disease such as eczema. In the former case, the subjects are often small and weakly babies, and in them the swellings assume the characters of cold abscesses. But, however much they resemble the tubercular abscesses to which we are accustomed in older people, we must not too hastily conclude from their chronic course that they are of tubercular origin. Very often, even in the most marasmic infants, healing rapidly ensues upon simple incision. **Furunculosis** is not uncommonly seen in children. Localised **gangrene** may complicate varicella affecting weakly infants. In such cases the disease is often fatal. More extensive gangrene and sloughing of the integument sometimes occurs in unhealthy children. At times it affects almost the whole of the body, and may, in some cases, be an expression of the syphilitic cachexia. **Ulceration** is usually due to trauma, such as a burn or abrasion, followed by neglect. Tubercular ulcers may occur, as also may syphilitic. Of the latter form, those following rupia are probably the commonest.

CHAPTER VII.

DIAGNOSIS (*Continued*).—ALIMENTARY AND HÆMOPOIETIC SYSTEMS.

Contents.—**Examination of the Alimentary System**: **I. Mouth and Adjacent Parts**—Lips—Mouth—Gums—Teeth—Tongue—Palate—Tonsils, Fauces and Pharynx—Œsophagus—**II. Digestive Functions**—Thirst—Appetite—Perverted Appetite—Vomiting—Vomited Matters—Defæcation—Constipation—Diarrhœa—**III. Physical Examination of the Abdomen**—General: Inspection—Palpation—Percussion—Auscultation—Examination of Individual Organs: Stomach—Liver—Rectum and Anus—**Examination of the Hæmopoietic System**: Spleen—Glands—Salivary Glands—Thyroid—Thymus—Blood.

EXAMINATION OF THE ALIMENTARY SYSTEM.

I. MOUTH AND ADJACENT PARTS.

Lips.—Herpes is common, but is obscured by the bursting of the vesicles from the scratching to which they are subjected, and their replacement by crusts. It is often present in ordinary catarrhs and also in several of the infectious diseases, such as pneumonia and influenza. Occurring along with the symptoms of meningitis, herpes of the lips suggests the epidemic cerebro-spinal, rather than the tubercular form of that disease. It is seldom seen in typhoid fever. Dryness and cracking of the lips are found in many acute illnesses—meningitis, typhoid, &c. Cracking is more frequently present in typhoid than in pneumonia, though also seen in the latter. The frequency with which eczema and impetigo occur about the lips is probably due to the conveyance of the infection by the fingers from other patches of eczema to the region of the mouth. Excoriations about the angles of the mouth are very frequently, though by no means always, of syphilitic origin. In every case one should evert the lips and look for the whitish raised mucous patches, which, if seen, are pathognomonic of syphilis. In the condition called *perlèche* (which is common in certain parts of France) lesions occur at the angles of the mouth, and cause the child to keep constantly licking the lips. A macerated condition of the epithelium, strictly confined to the commissures, ensues, and occasionally slight excoriations or bleeding fissures may result. The appearance is very like the mucous patch of syphilis. The disease is common in schools, and is propagated by pencils, &c., which have come in contact with some of the buccal secretion. Fissures (rhagades) at the angles of the mouth, or radiating scars the result of the fissures, occur in congenital syphilis, and when present along with the depressed nose and the frontal bosses give a very typical appearance to the face. When scars are found the other common lesions of syphilis—Hutchinson's teeth and interstitial keratitis—should always be looked for. The presence and extent of hare-lip, as well as its association with cleft palate, should be carefully noted.

Mouth.—In older children there is no difficulty in the inspection of the oral cavity, tongue, and throat, but in the young child so much resistance is provoked that it is well to postpone this until towards the end of the examination. In such cases, after everting the lips and noting the condition of the mucous membrane and the gums, we can often get a view of the mouth by gently pushing in the cheek on both sides between the jaws. Should this manœuvre fail, the tongue can usually be seen by applying a moist cork to the chin, when the organ is protruded to lick the place. If other means fail, the jaws must be forcibly separated by a spoon, a process which is facilitated by holding the nose so that the patient has to breathe by the mouth. When it is necessary to examine the tonsils and neighbouring parts thoroughly, the end of the spoon should be placed on the posterior part of the tongue just in front of the epiglottis and depressed; as the child retches a complete inspection of the whole fauces can be made.

Hyperæmia of the cavity of the mouth, associated with dryness and a glazed appearance, from lack of the secretion of the salivary glands, is the normal condition in the infant. In older children a superficial inflammation (catarrhal stomatitis) is often seen in feverish conditions, especially in infectious diseases, gastro-intestinal catarrhs, &c. Little blebs from blocking of the muciparous ducts are sometimes present along with this; these burst and lead to the formation of ulcers. The almost constant occurrence of a general catarrhal stomatitis in rötheln is of some value in the diagnosis of that condition. A somewhat severe form of stomatitis, and one associated with much pain and salivation, is that in which, in addition to the catarrh of the mucous membrane, vesicles form beneath the epithelium. The epithelial covering of the vesicles is, however, soon shed, leaving small ulcers with greyish bases, which become raised above the level of the surrounding tissues. This is known as aphthous or herpetic stomatitis. The ulcers readily bleed, and as they heal lose their grey base. They develop on the tongue, on the inner surfaces of the lips and cheeks, and on the floor of the mouth. The disease frequently attacks several members of the same family. We sometimes find little ulcers in the mouth associated with impetigo about the lips. These appear to result from auto-infection.

In thrush or mycotic stomatitis numerous white raised spots are seen; they occur chiefly on the tongue and palate, and to a less extent on the inner aspects of the lips and cheeks. Slight friction separates these patches, and that without bleeding. They have to be distinguished from particles of curdled milk, and should any doubt exist, the microscopical examination and discovery of the *Oidium* (*Saccharomyces*) *albicans* is conclusive. Thrush is usually seen in weakly infants who do not move the tongue vigorously. The eruption of chicken-pox occurring in the mouth gives rise to an appearance not unlike aphthous stomatitis. The spots, however, are more discrete, and vesicles and pustules are also to be found on the general surface of the body.

The presence of a membrane on the buccal mucosa is practically unknown, except in cases of diphtheria of the tonsils and soft palate; even with this, the condition is somewhat rare. In the early stages of noma or cancrum oris, an ulcer with an indurated base appears on the inner aspect of the cheek. It gradually enlarges, and at length an inflammatory area is seen on the outer surface of the cheek; the tissues become infiltrated and very dense, the central part sloughs, and eventually an opening into the mouth is produced. As the process goes on the deeper structures are affected, parts of the maxillæ may become necrosed, the breath is very fœtid, the patient becomes more and more asthenic and dies.

Gums.—When teeth are about to appear the gums become somewhat inflamed and tender, and with this salivation occurs. Ulceration of the gums (ulcerative stomatitis) is not uncommon. It is conjoined with profuse salivation and great fœtor from the mouth. The process begins at the margins of the gums, which swell and bleed readily, and become dark and sloughy; the sockets of the teeth are exposed and the teeth themselves may become loosened. The patient is often rather severely ill, and the ulceration may spread to the cheeks and give rise to apprehension lest true noma be commencing; this sequel is, however, excessively rare.

In infantile scurvy swelling and ulceration of the gums are only seen where teeth exist. The gums become hypertrophied and spongy, and are sometimes so protuberant as to fill the whole opening of the mouth. The tendency to hæmorrhage is great, and other signs of infantile scurvy are present. A form of stomatitis somewhat resembling the ulcerative variety described above is produced by the prolonged use of mercury. In nearly all forms of stomatitis, whatever be the cause, the submaxillary glands enlarge and become tender.

Dentigerous cysts, mucous cysts, and ranulæ are also met with.

Teeth.—The number of the infant's teeth should always be noted, as giving an indication of the general state of development. Late dentition is seen in rickets, but is also seen in cretins, and, to a less degree, in all children who have been brought up on the bottle. Apart from any disease or backwardness of development, there are individual peculiarities in this respect, and delay in the eruption of the teeth is often seen in several members of a family. Early dentition is not uncommon in congenital syphilis. Infants are sometimes born with teeth, or the teeth appear within a few days or weeks of birth. These should not be removed unless they interfere with nursing. Should the permanent teeth appear before the temporary ones have fallen out, their position must of necessity be abnormal; to prevent this it is often advisable to extract the milk teeth. Transverse striation of the teeth may occur after severe illnesses and after the administration of mercury; in some cases no cause can be found. Rickets has been blamed, but in all probability without sufficient reason. Hutchinson's teeth are seen in congenital syphilis. The permanent upper incisors are separated widely, are peg-shaped, tapering from the root downwards, and are bevelled and notched. To be of diagnostic value these appearances must be typical. In rickets, the enamel of the teeth is not infrequently defective; this results in early caries. Decayed teeth are, however, due to many other causes, the chief being the use of acid medicines, neglect, and the excessive use of sugar. Bad teeth are often associated with gastro-intestinal disturbance. A smooth, worn condition is evidence of grinding the teeth during sleep. This usually arises where there is some digestive irritation.

Tongue.—In the first weeks the tongue, like the general cavity of the mouth, is dry. In infancy, when the diet consists entirely of milk, there is usually a fine whitish layer on the tongue, but in later childhood the organ becomes clean and moist, resembling the adult condition. A greyish-white coating with pallor and prominence of the papillæ is commonly seen in gastric catarrhs. In the early stages of scarlet fever the tongue is covered with a thick yellowish-white fur through which the red papillæ project; after a day or two the fur gradually disappears, leaving the tongue still more deeply congested, with very prominent papillæ—the so-called "red strawberry tongue." In the earlier stages of typhoid fever the surface of the tongue is covered with a whitish coat, whilst the tip and edges are bare and somewhat congested. In the later stages the organ is dry and yellowish-brown. As the other signs of typhoid are often ill-marked in children, the appearance of the tongue is of considerable diagnostic value. In the condition which has been named "mucous disease," the tongue is large and flabby and the margins somewhat indented. The surface is often partly covered with a yellowish fur, and the fungiform papillæ are conspicuous; but the most typical character is a slimy appearance, either over the whole surface or limited to a small part in the centre. The tongue looks as if it had been covered with white of egg; this is due to an excessive secretion of mucus in the mouth, a condition shared by the whole alimentary tract. The "lingua geographiea" is characterised by the appearance of raw red patches with sinuous outlines, denuded of epithelium, amidst the grey fur covering the rest of the tongue. The condition is found in various forms of chronic gastro-intestinal disturbance, and is of little diagnostic value.

Ulcers on the side of the tongue are, as we have seen, common in aphthous stomatitis. As in the case of the tonsils and soft palate, the lesions of congenital syphilis are much less common on the tongue than are those of acquired syphilis in the adult.

A tight frenum linguæ may be the cause of inability to suck; if so, it should at once be snipped through with scissors. The only other common symptom to which it gives rise is some difficulty in articulation as the child begins to speak. Very frequently a mother complains that her child's tongue is tied when it is of quite normal length. A really short frenum appears to be a rather rare occurrence. A small ulcer with a white base is often found on the frenum in whooping-cough. It is caused by the repeated impact of the part against the lower incisors with the paroxysms of coughing. Although not pathognomonic of pertussis, it may prove of diagnostic value.

Palate.—In newly-born children small, millet-seed sized, greyish-yellow bodies may be seen on each side of the middle line of the palate; they are of no pathological moment. In the first weeks of life two small ulcers sometimes occur on the posterior part of the hard palate near the alveolar margins; these are the result of some injury to the sensitive mucous membrane, such as too vigorous cleansing, an ill-fitting nipple, &c. They are known as Bednâr's aphthæ. Thrush usually extends to the palate, and the ulcers of stomatitis and chicken-pox are also not uncommonly seen there.

The contour of the palate should be noted; it may be flat or arched—the so-called "Gothic" palate. This is seen in about 50 per cent. of all persons examined, and in a larger proportion of those of the neurotic diathesis. Irregularity of the teeth and deformity of the alveolar margin are usually attended by a highly-arched palate. Cleft palate, with or without hare-lip, is a common malformation; its presence and extent should be noted. Defects from ulceration are rare in childhood.

Paralysis of the soft palate is one of the sequelæ of diphtheria, and indeed may be the first indication that the patient has suffered from this disease. It is shown by regurgitation of fluids through the nose, from the inability of the paralysed structure to close the opening into the nasopharynx during the act of swallowing. If the child be old enough, the paralysis may also be demonstrated by immobility during phonation and inspiration, as well as by the nasal tone of the voice. In peritonsillar abscess, the swelling and infiltration usually occur in the soft palate just above the tonsil. Here a dark red area, tense, and tender to the touch, is found, and at this point the incision should, as a rule, be made. Extension of the membrane to the soft palate is common in diphtheria of the tonsils; its presence here is almost pathognomonic of the condition. A long uvula, with or without œdema, generally associated with, or following pharyngitis, is a not uncommon cause of repeated and painful attacks of coughing. In scarlet fever, the fauces, pharynx, and palate have a bright red, punctate appearance when the rash first appears; later, the redness is of a more diffused character. In the early stage of measles the palate has a darkish-red mottled appearance closely resembling the rash which later develops on the skin.

Tonsils, Fauces, and **Pharynx.**—We would again repeat that the inspection of the throat in a good light is an essential part of the examination of every child who is ill. Good daylight is the best, but, failing this, a lamp with or without a reflecting mirror may be used. A candle held in front of a metal spoon answers the purpose admirably. In addition to inspection, palpation of the tonsils or pharynx for fluctuation may be required; and, after inspecting the throat, it is convenient to examine the nasopharynx with the finger should it be necessary.

Like all the lymphoid tissues of the child, the tonsils are relatively large and liable to pathological processes. A chronic enlargement of the tonsils, at times so great as to lead to interference with breathing, is very commonly seen. This is often associated with enlargement of the glands in the neck, and with adenoids. The principal symptoms of adenoids are snoring at night, open mouth and hanging lower jaw, elongation of the face, and a dull and heavy expression. There is also usually deafness and slight backwardness of the intelligence. An acute inflammation of the tonsils, with general redness of the fauces and pharynx, is seen in many acute diseases. It is especially marked in rheumatism, scarlet fever, and (to a less extent) in the remaining exanthemata; it is often present in gastro-intestinal derangements with absorption of toxins from the alimentary tract.

Suppuration in the tonsil or in the peritonsillar tissue is not uncommon in later childhood. The pain is extreme, and swallowing is rendered difficult or impossible. A unilateral swelling covered by dark congested mucous membrane is seen, and in the later stages fluctuation may be detected by the finger. In peritonsillar abscess the swelling is usually greatest above and to the outer side of the tonsil, and the pus generally escapes here or through the anterior pillar of the fauces at a somewhat lower level. Subacute enlargement of the tonsils is also common. In glandular fever it occurs as the initial symptom of infection.

Whitish or greyish **patches** are frequently seen in the throat, and it is important at once to determine their precise nature. A mere glance enables us to recognise curdled milk, mucus, &c., lying on the surface, and thrush upon the throat is always associated with thrush upon the tongue and palate. But if we have to deal with a true exudation the important point to be decided is :—Is this diphtheria or not? And although diphtheria is really a clinical term, formerly applied to all conditions in which a false membrane was found in the throat, it is now necessary, in view of modern bacteriological investigation, and yet more since the introduction of the antitoxin treatment, to restrict the word "diphtheria" to lesions caused by the Klebs-Löffler bacillus. The disease most likely to be confused with diphtheria is follicular tonsillitis with exudation from the crypts of the tonsils. In the vast majority of cases the diagnosis can be made by the facts that in tonsillitis the patches are smaller and more numerous, are white or whitish-yellow in colour, seldom pass beyond the surface of the tonsils, and can be detached fairly readily by a probe passed beneath them. After they are removed the exposed surface of the mucous membrane does not tend to bleed, while on the under aspect of the exudation casts of the tonsillar crypts can often be seen, and the exudation is soft and breaks down readily when placed in water. On the other hand, in diphtheria the false membrane is usually of a greyish appearance, the masses are fewer and larger, and frequently involve the soft palate and uvula, or even the wall of the pharynx, as well as the tonsil. The exudation is only removed with difficulty, and leaves behind a bleeding surface, which is quickly covered over again with a false membrane. The temperature is usually higher in tonsillitis than in diphtheria, and when, along with a comparatively small amount of exudation (in which case alone is the diagnosis really difficult), much swelling of the palate and uvula is seen, our suspicions are turned rather in the direction of the case being one of simple, not diphtherial, infection. Albuminuria is much more frequently present in diphtheria than in follicular tonsillitis.

Although in many instances diphtheria can be diagnosed by attending to the points just mentioned, it must be remembered that in some cases of apparently simple catarrhal pharyngitis, as well as of follicular tonsillitis, Klebs-Löffler bacilli of a virulent nature are present and are in all probability the cause of the condition. On the other hand, cases with a true pseudo-membrane very closely resembling that of diphtheria may occur quite apart from the existence of the Klebs-Löffler organism, and be due to the presence of pyogenic cocci. It will, therefore, be evident that in all suspicious cases the membrane must be examined for the presence of the diphtheria bacillus, though, unfortunately, this cannot be carried out with that certainty and speed to which we are accustomed in looking for the bacillus of tubercle in the sputum of a phthisical patient. The method which is adopted is roughly as follows :—A piece of the membrane to be examined is removed from the throat by means of a sterilised swab, part of it may be stained at once with Löffler's alkaline methylene blue, dahlia and methyl green, or other suitable stain. Often, but not invariably, a diagnosis can be immediately arrived at. In some cases it is necessary (and in all it is advisable) to make cultures upon blood serum or serum agar. After remaining about 14 hours in the incubator the growth in the tube is usually sufficiently characteristic to show whether or not we have to do with the diphtheria bacillus. In some instances it may be necessary to make further test by the inoculation of animals.*

In a considerable number of instances—cases of mixed infection—the Klebs-Löffler bacillus is found along with the streptococcus or other organism. When this is so, there is usually much greater swelling and inflammation of the throat, while the glands of the neck are also more swollen and may suppurate. Occasionally a widely spread cellulitis ensues. False membranes may develop in the pharynx in scarlet fever, various septic conditions, &c. In some of these cases we have an infection with the organism of diphtheria *plus* pyogenic organisms; in others, only the latter of these, and particularly the streptococcus In scarlet fever, if these membranes appear before or during the height of the fever the probability is against diphtheria; when they appear later, the probability is in favour of diphtheria.

It may not be out of place, even in a section on diagnosis, to indicate the practical bearing of the bacteriological and clinical aspects of this question. If we depend entirely upon the appearance of the throat there is no doubt that some mild cases of diphtheria will be passed over, and a few severe (coccal) throat affections be included. If, on the other hand, we only regard as diphtheria those where the Klebs-Löffler bacillus is present, we shall include a number of mild cases of tonsillitis and pharyngitis, and omit a few grave forms of membranous pharyngitis. Taking now the prognosis. The severity of a case is mainly determined by its clinical appearance—that is, though bad types of the disease are usually attended by virulent forms of the bacillus, or by the presence in addition of pyogenic organisms, the severity of a case can generally be judged of before a bacteriological report can be obtained. Second, if in a slight case resembling a mere tonsillitis, the Klebs-Löffler bacillus were found, the immediate prognosis would not thereby be rendered very serious. Experience shows that such clinically mild cases recover well. Then, as regards infection. It has for long been recognised that all patchy throats are contagious, and ought to be isolated; the more severe the lesion, the greater the necessity for care in this respect. Bacteriology shows us the needfulness for such a step, for it must be at least possible for a slight tonsillitis where the Klebs-Löffler bacillus is present to give rise to a much worse type of diphtheria. Lastly, with regard to the treatment. The finding of the organism justifies the use of the appropriate serum. Since, however, the diphtheria antitoxin has almost certainly no deleterious action, we usually employ it in the first instance, without awaiting the result of the bacteriological examination.

---

* In some false membranes, organisms are found which are morphologically almost identical with the Klebs-Löffler bacillus, but differ in their cultural characters and in the action of their toxines on animals. Some of these bacilli are quite distinct from the organisms of diphtheria, others are modified Klebs-Löffler bacilli which have lost their virulence, but may, if placed in suitable surroundings, again become active.

In herpes of the throat greyish patches, somewhat like diphtheria, may also be seen. They appear in the first instance as vesicles, and at a later stage are seen to consist, not of exudation, but of ulcers with grey bases. They may be associated with herpes of the lips or nose, or with herpetic stomatitis. Like syphilitic ulceration of the mouth, syphilitic ulcers of the throat are much less common in childhood than in later life. Secondary ulcers, more or less symmetrically disposed, may, however, occur, and occasionally asymmetrical tertiary ulceration is met with.

Retropharyngeal abscess may show itself by interfering with deglutition, and causing regurgitation of fluids through the nose. As a rule, however, it affects chiefly the respiration, and leads to some inspiratory difficulty and stridor; the neck is usually held fully extended. The abscess is generally due either to caries of the cervical vertebræ or, in acute cases, to suppuration of the glands in the posterior wall of the pharynx.

Œsophagus.—Œsophageal affections are not at all common in childhood. Of congenital malformations, absence of the whole or part of the œsophagus, and diverticula, may be mentioned. The swallowing of corrosive fluids leads to injury of varying severity, and the subsequent cicatrisation is the usual cause of stricture in children. An abscess may develop behind the œsophagus, either from glandular disease or from spinal caries; it rarely gives rise to any difficulty in swallowing.

II. DIGESTIVE FUNCTIONS.

Thirst is a very common symptom in all feverish conditions. In acute and chronic gastro-intestinal catarrh, especially when accompanied by diarrhœa, the thirst is also very great.

Appetite.—In many cases of gastro-intestinal derangement of childhood the appetit is almost completely gone, but in the gastric indigestion of infants, associated with the decomposition of milk, the patient cries for the bottle, and, as feeding usually soothes for a time, the mother is only too glad to have recourse to it whenever the child frets. The effect of introducing fresh milk is to quench the thirst and to allay the fermentation temporarily, but the latter soon proceeds apace, so that giving more milk only increases the suffering of the patient. In older children also, chronic gastric catarrh is often associated with a large appetite.

Perverted appetite is at times seen. A longing for unnatural substances, such as coal, earth, or plaster, may occur in children who are out of sorts or suffering from a chronic ailment. It is also seen in infants, sometimes when only a few weeks or months old.

In these cases it usually ceases when the child reaches the age of 2½ or 3 years. These patients have pale dirty complexions but are not very anæmic, their eyes are hollow, and they have a hungry appearance. The physiognomy is at times so marked that a diagnosis has been made from it alone. (*Thomson.*)

Vomiting is very frequent in children, and is in them of much less diagnostic value than in adults. In part, because of the more vertical position of the organ; in part, because of the comparatively slight development of its cardiac sphincter; and, in part, no doubt, on account of the excitable nervous system of the child, the stomach can empty itself of its contents very readily. If the child suck at all greedily regurgitation of a small quantity of milk soon after the act is extremely common. When this occurs regularly the amount of milk given at each feeding should be reduced. Vomiting is easily brought about if the infant be moved much immediately after feeding.

At the onset of most acute illnesses vomiting is one of the most important symptoms; it is, however, of no diagnostic value so far as the exact nature of the illness is concerned. It is seen in practically all forms of gastritis, and is then constantly associated with diarrhœa, because, particularly in bottle-fed children, gastritis is generally combined with enteritis, both being due to some change in the milk. Improper feeding of any kind usually leads to the same train of symptoms. In many cerebral diseases vomiting is the prominent, it may be, the first symptom. This is especially the case in meningitis, tubercular or simple, but it also occurs in other brain lesions—abscess, tumour, &c. In such cases, the vomiting often has no relation to the taking of food. The spasms of whooping-cough are usually terminated by the emptying of the stomach, and in doubtful cases this is of considerable diagnostic value. Children sometimes induce vomiting by passing the fingers into the pharynx in order to obtain relief from the paroxysm.

Persistent vomiting is of much diagnostic value. In gastric catarrh it may occur repeatedly, but, as a rule, chiefly after the ingestion of food. In intracranial affections vomiting at irregular intervals, particularly after movement, is a common symptom. Constant vomiting, without reference either to the taking of food or to the position of the patient, is especially characteristic of some form of obstruction of the bowels. Thus in early infancy it may be due to congenital stenosis of the duodenum or large intestine. In the former case the symptoms occur earlier than in the latter, in which they may be delayed for some days or even remain absent. Intractable vomiting during the first months of life may also be due to congenital hypertrophy of the pylorus. In later infancy and childhood all forms of acute and chronic intestinal obstruction are associated with vomiting, and in an acute case the vomited matters consist first of food, then of bilious fluid, and finally become fæcal. Along with this there is usually absolute constipation and distension of the abdomen.

Several cases have been recorded in which vomiting recurred at intervals of several months, while between the attacks the patient was in the best of health. The paroxysms are severe and exhausting, and pass off gradually after lasting from one to several days. This—cyclic vomiting—is evidently a neurotic condition, and is seen in children of gouty or nervous heredity. Vomiting is also observed as a symptom of various different diseases. In acute carditis and heart failure generally, as in that following diphtheria, uncontrollable vomiting is a sign of the greatest gravity and often presages the end. Uræmic vomiting, too, is sometimes noticed in children.

Vomited Matters.—In infancy all that is usually regurgitated is milk, more or less altered. Many mothers have an idea that something is wrong when the milk is returned curdled, and require a word of explanation to allay their fears. In cases of intestinal obstruction bile is generally present in the vomit, and if the obstruction be low down—towards the ileum—the vomit may be fæcal. Undigested substances are often present in the vomited matters and indicate the cause of the digestive disorder.

Hæmatemesis is occasionally met with in the first few days of life. It may occur alone, but is more commonly associated with melæna, bleeding from the umbilicus, &c., and is usually a manifestation of the hæmorrhagic diathesis of infancy. At a later period, vomiting of blood is even less common. It is often complained of, but, as a rule, the source of hæmorrhage is to be found in the mouth or gums, so that we only have to do with a spurious hæmatemesis. Ulcer of the stomach is uncommon, and the other two chief causes of vomiting blood (in adults)—cancer of the stomach and cirrhosis of the liver—are so rare that they may be practically neglected. In acute gastro-enteritis the vomit is occasionally tinged with blood, and the hæmorrhage has been even so profuse as to prove fatal. Hæmatemesis may also occur in purpura, hæmophilia, scurvy, and some blood disorders, as well as in infectious diseases with a hæmorrhagic tendency.

When blood is seen in the vomit the possibility of its having come from the nose, mouth, or naso-pharynx, and having been subsequently swallowed, must be kept in mind. These regions should therefore be examined before a diagnosis of true hæmatemesis is made.

Large quantities of mucus may be seen in cases of mucous disease, and in whooping-cough, bronchial catarrh, and catarrh of the posterior nares and naso-pharynx; in the latter instances the vomiting usually takes place after a fit of coughing. Round worms are occasionally present, having found their way into the stomach from the upper part of the small intestine.

Defæcation.—The bowels at first move involuntarily, and only gradually come under the control of the will. Not uncommonly, however, this control is late in developing; in some cases the incontinence may be due to peripheral irritation, but more frequently it is associated with mental deficiency. After control of the rectum has been acquired, it may again be lost temporarily after a severe illness, and occasionally incontinence of fæces occurs along with enuresis. Severe coughing in young children—as in whooping-cough—may be accompanied by a movement of the bowels.

Constipation may be due to the character of the diet as well as to disorders of the intestine and nervous system, &c., as in the adult. If, in a newly-born child, no meconium be passed within the first 36 or 48 hours a careful examination must be made in order to ascertain whether a congenital stenosis or obstruction of the bowel does not exist. Such malformations are by far most frequently met with at the rectum or anus; this region, therefore, should first be investigated. We may find that the anus is absent or imperforate, or that on passing the little finger into the bowel there is a complete occlusion of the gut, or perhaps only a partial stenosis. In bottle-fed children constipation is frequently the result of a too small proportion of sugar or fat, and a too large quantity of proteid in the food.

Diarrhœa.—At first the bowels move from 3 to 6 times daily; after a fortnight the frequency is less, and after the second month there should be about two stools per diem. A too frequent action of the bowels is extremely common in childhood. In enquiring into this point the exact number of the motions should be ascertained. Often enough the mother will say that the bowels are all right, when in reality they are acting five or six times daily. The chief causes of diarrhœa are gastric and intestinal indigestion and infected food; the latter is particularly common in bottle-fed children, especially in summer and in hot climates. Diarrhœa is frequently associated with the presence of flatulence, and when this is the case the probability is that the small intestine is chiefly affected.

The passage of a stool may be preceded or followed by pain. In the former case the child cries before the act and is relieved by the emptying of the bowel; in the latter, crying occurs during and after the motion, and there is much subsequent straining. In the first case the diarrhœa is due to catarrh of the small intestine; in the second, there is some lesion of the colon or rectum, or, it may be, an ulcer of the anus.

Much information may be gained by a careful examination of the **Fæces.** In the young their consistence is much softer than in later years. In all forms of diarrhœa the stools are more liquid than normal; in cholera infantum they are of almost watery consistence. The odour is often characteristic, and this is especially so in summer diarrhœa, where the pungent smell of the fatty acids may pervade the whole sickroom, and be by itself sufficient to permit of a diagnosis. In young children the motions may be faintly acid in health; in older children, as in after life, they are alkaline. The chief diagnostic importance of the amount of the stool is this: large watery infrequent motions point to catarrh of the small intestine; frequent scanty stools containing mucus, to colitis.

The colour should also be noted; the brownish-green of the meconium, and the yellow hue in the healthy milk-fed child are characteristic. Green stools are frequently seen, in particular in summer diarrhœa, and after the administration of calomel. Many causes have been adduced to account for this green colour; among the most generally accepted are the presence of biliverdin from excessive activity of the liver, or the occurrence of certain chemical products resulting from the action of micro-organisms. Dark or greyish stools are seen after the ingestion of the preparations of iron, bismuth, and other inorganic salts. The same colour proceeds from the extravasation of blood high up in the alimentary canal. Bright yellow stools are produced by santonin, rhubarb, and senna.

The constituents of the fæces may be to some extent a guide in the diagnosis. White fragments of undigested curd are often seen in the stools of bottle-fed babies, especially where the proteid is excessive; these must not be mistaken for fat, the glistening globules of which are frequently present in cases of gastro-intestinal catarrh. Blood may occur in the motion, either in considerable quantity, as in acute dysenteric diarrhœa, where shreds of dark mucous membrane with an intensely fœtid odour may also be present, or to a slighter extent, as in catarrhal diarrhœa, where there is usually in addition a considerable amount of mucus in the stools.

In older children undigested food may be seen, giving rise to what is known as lienteric diarrhœa. In these cases the diarrhœa generally takes place soon after meals, the food being hurried along the alimentary canal. In many cases indigestible bodies—fruit-seeds and the like—may be found in the fæces.

Parasites are common in children. The principal of them are (1) oxyurides; (2) ascarides; (3) tæniæ. The chief tape-worms found are *Tænia mediocanellata* (*saginata*), *T. solium*, and less commonly, *T. cucumerina*.

III. PHYSICAL EXAMINATION OF THE ABDOMEN.

(*a*) GENERAL.

1. **Inspection.**—Abnormal prominence of the abdomen is common; it may be actual or apparent. Thus in cases where lordosis exists the abdomen is prominent on account of the lumbar concavity. This is seen in the lordosis of rickets, of pseudo-hypertrophic paralysis, and of congenital hip-disease. In patients too, in whom the lower part of the thorax is contracted—in pigeon-breast—the abdomen appears very protuberant; this condition is also frequently seen in rickets. Actual enlargement of the abdomen is a very common occurrence in childhood, and is mostly due to flatulence. It is observed in the majority of gastro-intestinal derangements, in intestinal obstruction with distension of the bowel above, in rickets, and in typhoid. It also results from tubercular

peritonitis, tabes mesenterica, and ascites from any cause. We are enabled to detect alterations in size by carefully measuring the circumference of the abdomen at stated intervals.

A local enlargement is very frequent, particularly in the regions of the liver and spleen, and in the right iliac fossa. In the last situation tabes mesenterica, tubercular peritonitis, and appendicitis are the more common causes of bulging. Prominence of the region of the stomach is common enough in flatulent distension of the organ, but a permanent swelling in this position is rare. In intestinal obstruction there may be a prominence corresponding to the point at which obstruction exists. Enlargement of the retroperitoneal glands, either tubercular or sarcomatous, may give rise to a very marked degree of bulging, most distinct usually on the right side. Enlargement may also occur in the lumbar regions from such diseases of the kidney as sarcoma, hydronephrosis, and pyonephrosis. In the case of herniæ, swellings are seen in umbilical region and groins.

General retraction of the abdomen is seen after attacks of diarrhœa, after exhausting illness, and when the child is not thriving well, always provided that there is no local lesion of such a nature as to lead to distension. Well-marked retraction is seen in severe marasmus and in the early stages of tubercular meningitis (scaphoid abdomen). In the latter condition the hollowing has some diagnostic value ; it is due to a spasm of the muscular coats of the bowel and of the abdominal muscles.

In abdominal tuberculosis the discolouration of the skin which is so common, is often particularly well marked over the surface of the abdomen. Dilatation of the superficial veins is seen in all conditions leading to pressure on the intra-abdominal veins. The distended vessels may disappear at the level of the diaphragm, or pass upwards and anastomose with vessels running down from the thorax. In young infants the state of the umbilicus requires notice. We may find a zone of inflammation surrounding it, suppuration may be going on, fungating masses may be present, or umbilical hæmorrhage may be taking place. Sometimes a patent Meckel's diverticulum can be seen, from which fæces exude ; little polypi of granulation tissue, or even true adenomata, may also be met with.

The movements of the abdomen should next be watched. In peritonitis or any other inflammatory condition a general or local absence of the respiratory movement may be noticed, according as the whole or only a part of the cavity of the abdomen is affected. At times the rhythm of the inspiratory and expiratory movements is reversed. Thus in all forms of laryngeal obstruction there is a tendency to inspiratory retraction of the epigastrium and lower ribs.

2. **Palpation.**—As the abdominal walls of the child are thin, and as there is generally but little fat deposited in them, palpation of the abdomen usually gives good results. These advantages are to some extent counterbalanced by the frequency with which crying renders a satisfactory examination impossible. But children take

chloroform so well and suffer so little inconvenience from its after-effects, that unless there be grave renal, cardiac, or pulmonary disease, we do not hesitate to induce anæsthesia when a thorough examination of the abdomen is necessary. In examining under chloroform the value of the recto-abdominal bi-manual examination should not be forgotten.

The results gained by inspection are corroborated, and, in addition, tenderness, either general or local, may be elicited. Small fluctuating areas may be felt in the anterior abdominal wall; they are usually of a tubercular nature, and must not be confounded with lesions inside the cavity. Undue resistance is common; if marked, it is suggestive of peritonitis, and it too, like the tenderness, may be general or local. General resistance, less marked in degree than that of peritonitis, is often to be observed in gastro-enteritis. In tubercular peritonitis the abdomen has a doughy feel either over its lower part or over a more extensive area. More distinct resistance is felt over an enlarged liver or spleen, and over enlarged (tubercular or sarcomatous) retroperitoneal glands. This is often most marked in the iliac and lumbar regions. In the latter of these situations a tumour of the kidney can also be palpated. A flat cake-like swelling is often to be felt in certain forms of tubercular peritonitis, while in others a broad thickened ridge—the densely infiltrated omentum—can be detected running across the abdomen below the level of the stomach. Appendicitis leads to an area of tenderness and resistance in the right iliac region. At times the affected part is more swollen, and has a distinctly boggy character. In intussusception a sausage-shaped swelling can generally be felt somewhere along the line of the colon, at first in the ascending, then in the transverse, finally in the descending colon—changing, therefore, in position from day to day. In acute cases the mass is tender, but when chronic, palpation gives little pain. The hernial rings should be examined. In the inguinal region a swelling is generally due to a hernia, an undescended testicle, or a hydrocele of the cord. The scrotum should therefore be felt, and if the testicle be absent the swelling is probably due to its presence in the canal. In most cases of hydrocele of the cord, but not in all, fluctuation can be detected; the percussion note is dull. A hernia containing gut gives a resonant note, and the impulse on coughing is more marked than in a hydrocele. In an infant a swelling in the region of the femoral canal is seldom due to a hernia, but is very commonly caused by an inflamed inguinal gland from absorption of septic material from some wound lower down in the leg. A psoas abscess points in this position; here other signs of spinal disease will be present.

In palpating the abdomen fluctuation is often detected. Should it be general, we are dealing with a case of ascites. The chief causes of this are tubercular peritonitis with exudation, pressure of tubercular glands on the portal vein as it enters the fissure of the liver, cirrhosis of the liver, &c. It also occurs in cardiac failure and renal dropsy, in abdominal tumours, simple chronic peritonitis, and, to a slight extent, in some blood diseases. We may also find a local collection of fluid. In tubercular peritonitis the effusion may be subdivided by adhesions, giving rise to a loculated ascites.

A localised collection of pus may also occur, as in appendicitis; cysts may, though rarely, be found.

By sharp palpation we not infrequently produce splashing sounds in the stomach and colon. They are not of much importance.

3. **Percussion.**—For the detection of the thin edge of a superficial organ the results got by "flicking" are more accurate than those of the ordinary method of percussion. As a rule, the tympanitic note of the stomach can be roughly distinguished from that of the colon, and the latter in its turn from that of the small intestine. It is, however, usually impossible to do more than partially outline these structures by percussion alone. The borders of the liver and spleen can usually be readily found, and abnormal areas of dulness should also be sought for. The principal causes of these are:—Tuberculous deposits in the peritoneum; tabes mesenterica, usually on the right side of the belly; ascites, either free or bound in by adhesions; new growths, such as sarcoma of the retroperitoneal glands; tumours and displacement of the kidney. The dulness resulting from certain tubercular deposits in the omentum may at first very closely resemble an enlargement of the spleen, but by careful percussion a small area of resonance can in most instances be made out between the spleen and the area of abnormal dulness.

4. **Auscultation.**—Alone, this method of examination is almost useless, but combined with percussion, as auscultation-percussion, it gives reliable information.

(*b*) EXAMINATION OF INDIVIDUAL ORGANS.

Stomach.—As we have seen, the stomach is more vertical in position than is the case in the adult. Not infrequently the lower border of the organ can be seen standing out fairly distinctly underneath the abdominal parietes. This is usually due to flatulent distension of the viscus in indigestion and gastric catarrh, rarely to congenital hypertrophy of the pylorus, in which it is associated with hypertrophy of the muscular coat of the stomach. Displacement of the stomach is rare in children; we practically never see that prominent bulging of the lower part of the abdomen so often observed in long standing dilatation of the organ in the adult.

Palpation gives, as a rule, little information as to the state of the stomach. Tenderness may be elicited in many forms of gastric disturbance, but as ulcer of the stomach is so seldom met with, localised tenderness can seldom be made out. In marked distension of the organ its lower border may be palpable, and in some cases of hypertrophy of the pylorus the thickened structure can be felt. Splashing sounds may be produced by palpation of the normal as well as the dilated stomach.

Dilatation is rare. It can be most satisfactorily detected, and the outline of the stomach mapped out, by the combined method of auscultation and percussion. A stethoscope is placed on some part of the parietes undoubtedly over the stomach, and as he listens, the observer percusses from the lower part of the abdomen towards his ear. As soon as the lower border of the stomach is reached a peculiar ringing character is imparted to the note heard through the stethoscope. The method is applicable to the dilated and healthy stomach, as well as to the other hollow viscera. When its inferior border is found so low as a finger-breadth above the umbilicus, the stomach may be looked upon as of abnormal size.

Liver.—Owing to the relatively large size of the child's liver, a distinct bulging of the lower costal margin and epigastric region is often seen, and this is particularly the case if the patient be much emaciated. Excessive bulging is seen in many cases—in syphilitic cirrhosis, waxy disease, blood disorders, hydatids, abscess, catarrhal jaundice, chronic venous congestion, &c. It is also seen in rickets, where it is largely apparent and due to the constriction of the chest walls above the level of the diaphragm, but also to some extent real and caused by an increase in the interstitial tissue of the organ. In other cases, a bulging over the hepatic region is not brought about by any involvement of the liver; thus, in right-sided pleural effusion, &c., a distinct prominence of the right hypochondrium may be noted. Pulsation of the liver is seen in various heart lesions with dilatation of the right side; actual distensile pulsation is very rare.

The lower border of the liver can usually be very readily palpated, provided that the child does not cry. The edge is felt as a comparatively soft structure about 1 in. below the costal margin in the nipple line. Irregularities of the surface are uncommon, but in older childhood gummata and certain forms of cirrhosis may give a slight amount of unevenness. Fluctuation is occasionally to be detected. In an abscess or hydatid below the level of the ribs it may easily be made out, and even when the collection of fluid is situated higher up it may be felt to fluctuate by palpating with one hand in front and the other behind. In the case of a localised area of fluctuation the diagnosis has to be made between an abscess in the abdominal wall, abscess in the liver substance, and a hydatid cyst. Distension of the gall bladder is very rare, and malignant disease is practically unknown.

On percussion, the borders of the liver are found to be considerably lower in the child than in the adult; the left lobe particularly is of relatively large size. The following are the approximate limits of percussion dulness in the infant. The upper border of the relative dulness is at the fifth rib in the mammary line, the seventh rib in the mid-axillary line, the ninth rib in the scapular line; the line of the absolute dulness is about ¾ of an inch lower than the above. In the mammary line the lower border of the liver reaches a full inch below the costal arch; in the middle line the left lobe reaches to within an inch of the umbilicus. An enlargement of the area of hepatic dulness is met with in all the conditions which have already been mentioned as increasing the size of the organ. A local enlargement, as in the case of abscess, frequently takes place in an upward direction. The area of dulness may be increased by the dulness of adjacent organs or new growths merging with it. By percussion, too, we are enabled to detect displacements. The liver may be pushed down by a pleural effusion, or by emphysema of the lungs; it may be raised if the intra-abdominal pressure be increased.

Rectum and Anus.—Irritation of the skin in the neighbourhood of the anus is very common in badly cared for children, and, notwithstanding the greatest attention on the part of the nurse, it is very apt to supervene in cases of diarrhœa, after this has lasted for some days. Along with snuffles and an eruption on the palms and soles, a rash about the anus and buttocks is one of the first signs of congenital syphilis. Condylomata may also be found here, and in the female about the vulva also. When a child emaciates the loss of the subcutaneous fat round the anus may be so marked that the orifice appears to pout instead of being depressed as in health. In certain cases of congenital malformation the anus may be altogether absent, in others it may be narrowed. Prolapse of the rectum occurs in diarrhœa; it may also result from any condition—such as a stone in the bladder—leading to frequent straining. It has to be distinguished from a rectal polypus, which may also come down during defæcation. Small ulcers about the anus are not very uncommon, and should be examined for in cases of painful defæcation and dysuria of doubtful origin.

The digital examination of the rectum is most important in childhood, particularly when combined with bi-manual examination, the other hand being placed over the lower part of the abdomen. We can thereby not only ascertain the condition of the anus and rectum, but can palpate adjoining parts, and especially the bladder, the pelvis, the iliac fossæ and adjacent regions, and in the female the internal organs of generation. Should the child strain very much anæsthesia must be induced. In infants the little finger should be employed.

The chief local conditions in which rectal examination gives information of value are imperforate anus and allied conditions in newly-born children; the position and extent of the stenosis should be observed, and also the presence or absence of bulging of the bowel above. Rectal polypi (which, however, are readily missed when of soft consistence), intussusception, and foreign bodies can also be detected, and the relations of tumours in the lower part of the abdominal cavity more or less accurately defined.

EXAMINATION OF THE HÆMOPOIETIC AND GLANDULAR SYSTEM.

Spleen.—Enlargement of the spleen is best recognised by palpation; percussion gives unreliable results and cannot alone be depended on to detect slight alterations in the size of the organ. When on palpating with the tips of the fingers below the left costal margin, the lower end of the spleen can be felt, the organ must be regarded as abnormally large. In such a case it can usually be detected, even when the parietes are tense, if we palpate as the child cries; with each inspiration the abdominal walls are momentarily relaxed, and as the diaphragm descends the rounded body of the spleen can be made out.

Enlargement of the spleen is common in childhood. Slight degrees occur in many infectious diseases, in particular in typhoid, septicæmia, and cerebro-spinal meningitis, in many abdominal affections, in rickets, and in congenital syphilis. A greater enlargement—the organ filling a large part of the abdominal cavity—is found in some cases of rickets and syphilis, in malaria, in waxy degeneration, and in Hodgkin's disease. It also occurs with some forms of anæmia, particularly where rickets or syphilis is also present, but sometimes independently of these, as in splenic anæmia and leucocythæmia. The enlargement of pseudo-leukæmic anæmia may also be mentioned.

Glands.—Slight general enlargement of the glands may be more apparent than real. In emaciated children the subcutaneous glands stand out prominently, and it is often difficult to say whether or not they are abnormal. A general enlargement may occur in leucocythæmia and in lymphadenoma, while tubercular adenitis is sometimes fairly widespread.

General swelling of the glands is occasionally seen in scarlet fever, rötheln, and syphilis. Local enlargement is extremely common. In the neck it may result from stomatitis, any form of sore throat, eruptions on the face and scalp, pediculosis capitis, carious teeth, mastoid disease, and sinus thrombosis. In order to appreciate the significance of glandular enlargement here, the drainage areas of the different groups of glands must be borne in mind. The posterior sternomastoid glands are hard and shotty in many cases of rötheln. Tubercular glands are very common, and the diagnosis of a non-suppurating tubercular infection from a chronic simple adenitis is no easy matter. We shall generally not be far wrong if we regard and treat as tubercular all chronic enlargements for which no definite cause can be found. In glandular fever the glands on one side of the neck become enlarged. A history of fever lasting for a day or two, succeeded by a swelling in the neck, and the course of the case, are the only means by which a diagnosis can be arrived at.

Hodgkin's disease may also occur. Here the enlargement is more general, successive packets of glands become enlarged; the diagnosis from tubercle is always most difficult, and in many cases regarded during life as Hodgkin's disease, tuberculosis is found after death (Fig. 9). Some physicians, indeed, question whether all cases are not really tubercular. In the axillæ glandular enlargement is generally due to peripheral infection from a septic abrasion. In the groin the same holds good. Here the point of entry of the sepsis is usually the leg or foot, but it must not be forgotten that it may be the external genital organs, as in the case of vulvitis in girls or excoriations of the prepuce in boys. When the infection enters by the leg the perpendicular series of glands is affected; when from the genitals, the oblique. The importance of glandular enlargements in the abdomen has already been mentioned; affections of the bronchial and mediastinal glands will be discussed in dealing with the respiratory system.

Salivary Glands.—Almost the only enlargement to which attention need be directed is parotitis. This occurs primarily in mumps. Here first one gland and then its neighbour becomes involved; there is little tenderness, the course is short, suppuration never occurs. Instead of affecting the parotid gland, the infection may lodge in the submaxillary—submaxillary mumps. But the parotid may become inflamed secondarily to a great number of abdominal conditions; typhoid, obstruction, operations for hernia, &c., are the most common of these. In such cases the affection is unilateral and suppuration may ensue. In rare instances chronic parotitis follows an acute attack.

Thyroid.—Absence of the thyroid may be noticed in cretinism; it is not, however, always easy to say that the gland is entirely absent. Instead of this, though somewhat rarely, the thyroid may be enlarged. Enlargement also occurs in goitre, Graves' disease, and physiologically at puberty.

Thymus.—Swelling of the thymus is difficult of detection. We may perhaps suspect it when with signs of respiratory obstruction, and no evidence of laryngeal disease, a dull area is found in the region of the manubrium sterni. This sign is by no means constant.

Blood.—In all anæmic states the red and white corpuscles should be enumerated, the hæmoglobin estimated, and fresh and stained films examined. For counting, Gowers' instrument is less satisfactory than the Thoma-Zeiss hæmocytometer. The hæmoglobin may be estimated by Gowers' or Fleischl's hæmoglobinometer. The latter is little more accurate than the former, but has the advantage of requiring a much smaller quantity of blood. Oliver's tintometer is more correct and reliable than either of the preceding, and requires, too, only a small drop of blood. The most important examination is that of stained films. For clinical purposes, a thin film is made on a cover-glass, allowed to dry for six hours or more, and then fixed for half an hour in a mixture of equal parts of absolute alcohol and ether. It is again allowed to dry, stained with a watery (2 per cent.) solution of eosin, washed, and then stained with saturated solution of methylene blue. By this simple method sufficient accuracy is

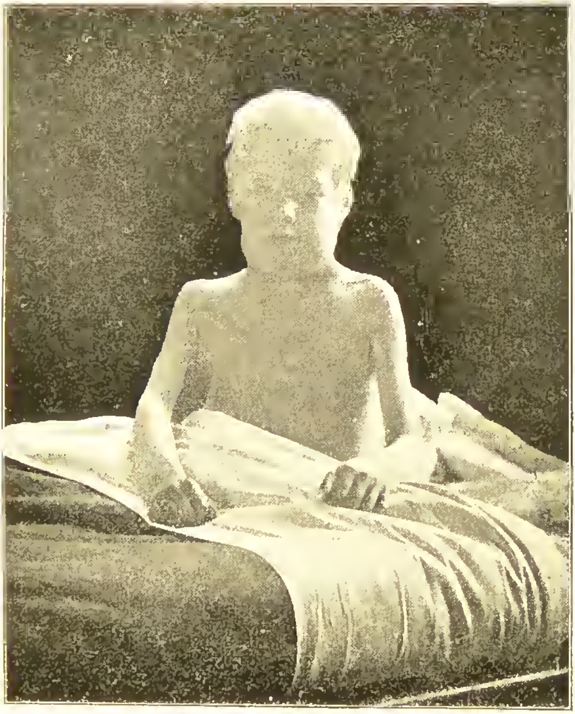


Fig. 9

TUBERCULAR ADENITIS SIMULATING HODGKIN'S DISEASE

ensured for clinical purposes, but the finer structure of the cells is completely destroyed. It is well first to look at a freshly drawn drop of blood and to notice the size and shape of the red corpuscles, the rouleaux formation (though to get a satisfactory view of the cells some part of the film at least must be so thin as not to permit of the formation of rouleaux), and, roughly, the proportion of white cells. In stained films it is best to examine successive fields of the slide systematically—a movable stage is of great assistance—and note on a piece of paper the different cells seen—the large and small lymphocytes, transitional forms, multinuclear cells, and eosinophiles. To get an idea of the proportions about 500 or 600 leucocytes should be counted. The number of erythroblasts present may be recorded as the number per hundred fields examined, or as the number per hundred leucocytes. Any abnormal cell observed should be roughly sketched as the enumeration proceeds, by this means much will be recorded which would otherwise escape observation.

CHAPTER VIII.

DIAGNOSIS (*continued*)—CIRCULATORY, RESPIRATORY, AND URINARY SYSTEMS.

Contents.—**Examination of the Circulatory System**: Heart—The Pulse—**Examination of the Respiratory System**: Epistaxis—Nasal Discharge—Dyspnœa—Voice and Cry—Respiratory Stridor—Cough—Pain in the Chest—Expectoration—Hæmoptysis—Inspection of the Chest—Palpation—Auscultation—Percussion—Exploratory Puncture—**Examination of the Urinary System**: Temporary Anuria—Increased Frequency of Micturition—Difficulty in Micturition—Incontinence of Urine—**Physical Examination of the Genito-Urinary System—I. Genito-Urinary Organs**: Kidneys—Bladder—**II. Urine**: Quantity—Albuminuria—Hæmaturia—Hæmoglobinuria—Indicanuria—Diaceturia—Glycosuria.

EXAMINATION OF THE CIRCULATORY SYSTEM.

Heart — **Inspection.** — Præcordial prominence is common in childhood. It may result from rickets, which permits of the falling in of the softened ribs over the lungs, whilst over the heart they do not do so. It is also an almost constant accompaniment of the cardiac lesions of children on account of the extreme degree of hypertrophy and dilatation which supervenes. Thus it is seen in congenital heart disease, in valvular disease, in adherent pericardium, and in pericarditis with effusion. In the last named the intercostal spaces may also bulge. Undue flattening of the præcordia is uncommon in childhood. It may exist to a slight degree along with the general flattening following pleuritic adhesions.

In plump well-nourished children the apex-beat may not be visible. In many cases, on the other hand, not only is it distinct, but there is, as well, a diffused area of pulsation in the spaces above the apex-beat itself. During the first year of life the apex is usually situated in the fourth space; it gradually descends, and by the seventh year is as frequently in the fifth as the fourth space, whilst after the thirteenth year it is almost invariably in the fifth space. But besides being somewhat higher, the apex-beat is also rather more lateral in position than in the adult. In the earliest years of life it lies external to the nipple line; by the seventh year it has assumed a position in the nipple line; and by the thirteenth year it should almost have reached its permanent situation.

Displacements and alterations of the character of the apex-beat have the same general significance as in the adult.

Systolic retraction in the region of the apex-beat is often to be observed. Owing to the relatively large size of the heart as compared with that of the thorax, the alterations in its dimensions during systole and diastole will produce relatively greater variations in the intrathoracic pressure. Occurring in the third and fourth spaces—*i.e.*, above the apex-beat—retraction is not of any particular significance. Actual systolic recession of the cardiac impulse itself is suggestive, though not pathognomonic, of adherent pericardium. A systolic pulsation in the second left interspace, from filling of the pulmonary artery, may often be noticed.

Distension of the veins of the chest wall is usually due to glandular enlargement or new growth in the mediastinum. Occasionally it may result from obstruction of the blood-flow through the superior vena cava by an adherent pericardium. Distension of the jugular veins is caused by increased backward pressure in cardiac and pulmonary disease. While dilatation is common, true venous pulsation is less frequently observed than in adults.

Palpation.—The position and character of the apex-beat, as determined by inspection, should be verified by palpation. The position of the beat varies considerably with alterations in the position of the patient. Fixation of the apex-beat is detected by noticing that such a change does not occur, and is of some value as indicating the presence of adhesions between the heart and the chest wall. The character of the cardiac pulsation is much more readily determined by palpation than by inspection. A heaving impulse is extremely common on account of the excessive hypertrophy which usually supervenes in congenital heart affections, valvular diseases, and pericardial adhesion. At this age these are almost the sole conditions which give rise to a heaving impulse. In adherent pericardium the retraction of the lower ribs and epigastrium is sometimes associated with a peculiar diastolic shock or rebound, due to the recoil of the adherent chest wall.

Epigastric pulsation is often to be felt in mitral disease, congenital heart disease, and obstructive lesions in the lungs leading to dilatation of the right ventricle. True hepatic pulsation is seldom present in children.

Endocardial thrills are very common. They are most frequent in the mitral area; occasionally they are aortic, and sometimes they are most marked above and internal to the apex-beat. The commonest mitral thrill is the presystolic, which is rough in character and ends with a sharp apex-beat. Associated with a presystolic thrill, or, it may be, apart from it, a diastolic thrill may be felt in the mitral area. This is usually finer than the preceding, is somewhat "wormy" in character, and, like the presystolic, is indicative of mitral stenosis. It may occupy any part of ventricular diastole. A diastolic thrill in the mitral area produced by aortic incompetence is rare, because the lesion to which it is due is seldom found in children. For the same reason, aortic thrills are infrequent; the systolic is, however, more often present than the diastolic. A thrill may be found somewhere between the mitral and aortic areas. It is often very rough in character, and may be most marked in the second, third, or fourth interspace on the left side. Such thrills are produced in many forms of congenital heart disease, such as pulmonary stenosis, incomplete interventricular septum, and patent ductus arteriosus. Their rhythm is nearly always systolic. A thrill due to pulmonary stenosis is usually best felt in the second left interspace—*i.e.*, higher than those due to defect in the interventricular septum and patent ductus. In these the point of maximum intensity of the thrill is generally in the third or fourth space, about midway between the lateral sternal and nipple lines.

An exocardial fremitus due to pericarditis may also be felt. It is, as a rule, best marked towards the base of the heart, and is most often systolic in time, but a diastolic rub can occasionally be made out.

Percussion.—In proportion to the size of the chest, the areas of cardiac dulness are somewhat larger in the child than in the adult. This is especially the case with regard to the comparative dulness, which reaches above to the lower border of the left second cartilage, on the right to the parasternal line, and on the left as far out as the apex-beat, which, up to the seventh year, is more frequently outside than inside the nipple line. The absolute cardiac dulness extends a little higher than in adults—to the third space or lower border of the third rib; it passes outwards nearly to the nipple line. Owing to the thinness of the chest walls comparatively light percussion is all that is required for the delimitation of the cardiac dulness. Even when light, percussion over the præcordia is at times painful. Slight tenderness may be present in functional affections of the heart, endocarditis, and some other conditions. When severe, tenderness is most commonly due to pericarditis, mediastinitis, and affections of the thoracic parietes. Variations in the size of the cardiac dulness are dependent on the same morbid changes as in the adult. It must be said, however, that less inference can be drawn from the shape of the dulness than in older persons. In pericarditis with effusion the results of percussion afford the best guides to the progress of the disease. Diminution in the area of cardiac dulness is not very common. It may be due to emphysema of the lungs following whooping-cough, but in such cases the condition is not usually permanent.

Auscultation.—The first sound of the heart in the child is normally somewhat short and sharp, and the second sound at the base of the heart is usually louder in the pulmonary than in the aortic area. The pauses between the sounds are nearly equal in duration. Thus the sounds differ both in character and in rhythm from those of the adult, and what would be morbid in a fully grown person is normal in the child.

Various modifications of the first sound may occur. It may be sharply accentuated, as in mitral stenosis; weakened, as in acute disease; or absent, as in pericardial effusion. Reduplication is not uncommon, and is often merely due to nervousness, in which case it passes away as the child regains confidence. Permanent reduplication is usually associated with some pulmonary lesion—chronic pneumonia, &c.—interfering with the circulation through the lung. In older children tobacco and the excessive use of tea or coffee may cause reduplication; it is also said to follow self-abuse. Chronic renal disease is too rare in childhood to be a frequent cause of the condition.

The second sound may be accentuated or reduplicated. These conditions usually coexist, and the pulmonary sound is that most generally affected. The detection of slight degrees of accentuation is rendered difficult by the fact that the pulmonary second sound is normally louder than that heard in the aortic area. The sign is present in the same conditions as in the adult—valvular disease of the left side of the heart, and chronic disease of the lung. A reduplication of the second sound best heard at the base has a similar significance. The so-called reduplication of the second sound at the apex is a sign of considerable diagnostic value. On listening at the mitral area the sound is split, but at the base of the heart the reduplication is absent. Practically, this sign is indicative of mitral stenosis, and of mitral stenosis only. That the apparent division of the second sound is not produced at the semi-lunar valves appears to be shown by the fact that it is not heard at the base, and probably the second part of the second sound is really produced at the mitral valve. It is, then, a diastolic sound or modified murmur. In certain cases the replacement of this sound by a distinct diastolic murmur can be traced as the patient is kept under observation. A triple rhythm—*bruit de galop*—is occasionally heard in a failing heart, especially where myocarditis, with or without pericarditis, exists.

Cardiac Murmurs.—Mitral murmurs are by far the most common, and a very large proportion of them are systolic. Nearly all of these are organic, hæmic cardiac murmurs being but seldom met with. Sometimes, however, in an acute illness a soft apical systolic murmur is heard from relative insufficiency of the mitral valve due to dilatation of the ventricle. When such a soft mitral bruit develops in the course of an illness, it is often difficult to say whether it is organic or functional. In the latter case it will disappear as convalescence proceeds; in the former it will probably remain, but it must be remembered that even a true inflammatory lesion of the valve may entirely vanish. Generally speaking, mitral systolic murmurs are exactly the same as in the adult. But, like all other bruits of childhood, they are heard over a wide area, and, consequently, their propagation is less clearly defined.

Presystolic mitral murmurs are common after the age of four or five. Before this age they are rare, but may occur even in the newly-born. They have the same characters as in the adult, and are often accompanied by a diastolic murmur. This murmur may be heard either early or late in diastole, giving a triple rhythm. As just stated, a diastolic bruit may simulate a reduplicated second sound. When the whole of diastole is occupied by a murmur, the condition is liable to be mistaken for a systolic bruit. By timing with the finger on the apex-beat the error can be avoided.

Murmurs produced at the mitral valve have their point of maximum intensity about the apex-beat. Other murmurs may be loudly heard at the mitral area, but in none of them is the apex the seat of greatest intensity.

In the tricuspid area a systolic murmur may be audible. In older children tricuspid regurgitation usually follows mitral disease, in infants it is generally secondary to pulmonary stenosis or some other congenital lesion, but may be due to fœtal endocarditis of the tricuspid valve. Presystolic and diastolic murmurs here are rare.

Of aortic murmurs, the systolic are much more common than the diastolic. In endocarditis of early life aortic stenosis is more frequent than regurgitation; it is also sometimes present as a congenital condition. A loud murmur in the aortic area, propagated up into the large vessels, is heard in cases of patent ductus arteriosus.

Murmurs produced at the pulmonary valve are nearly always of congenital origin. Practically all are systolic and due to stenosis; pulmonary incompetence is excessively rare.

Besides the murmurs mentioned, others due to different forms of congenital heart disease may be found. It is sometimes difficult to distinguish them from those of acquired valvular lesion, and still more to differentiate them from one another; in fact in most cases it is impossible to do so. We have first to determine whether the patient is suffering from acquired or congenital disease, and for this, attention to the following points is usually sufficient:—(1) The presence of great cyanosis is almost pathognomonic of congenital heart disease; along with this the red corpuscles are increased in number, and the fingers are usually clubbed. (2) Murmurs heard during the first few weeks or months of life are generally congenital; indeed, endocarditis is rare up to the third or fourth year. (3) Other bodily deformities are suggestive of congenital disease. (4) A history of rheumatism and the presence of a heaving apex-beat render the diagnosis of acquired disease probable. It must be admitted that in patent ductus and in imperfect interventricular septum the left ventricle is occasionally dilated and hypertrophied, but in most congenital lesions the left ventricle is unaffected, while the right is dilated. This occurs especially in the commonest form of all—pulmonary stenosis.

As regards the differentiation of congenital murmurs the following may be noted :—A loud, rough, systolic murmur, best heard in the pulmonary area, widely propagated, and accompanied by a thrill, is almost certainly due to pulmonary stenosis. As a rule, there is great hypertrophy of the right heart, and the second pulmonary sound is faint, but as the lesion is frequently combined with a patent foramen ovale, patent ductus, or incomplete interventricular septum, the signs may be considerably modified. The murmur is at times heard below the level of the second interspace.

In patent ductus a loud systolic murmur can usually be heard at the base of the heart ; it is propagated into the vessels of the neck, is occasionally accompanied by a diastolic murmur, and there is generally dilatation of both sides of the heart. The second pulmonary sound is usually accentuated ; there is seldom much cyanosis.

A deficient interventricular septum also gives rise to a systolic bruit ; it is best heard in the third and fourth spaces between the sternum and the left nipple line, and is propagated to the back. The pulmonary second is often accentuated. A murmur at the base of the heart may be produced by a patent foramen ovale ; its rhythm may be either systolic or diastolic. In any case of congenital heart disease the chief facts to be observed are the point of maximum intensity and the propagation of the murmur, the characters of the pulmonary second sound, and the percussion dulness of the heart as indicating which chambers are affected. The existence of cyanosis must also be noted. It will be remembered that marked abnormalities may occur without necessarily giving rise to alterations in the physical signs.

As we have seen, hæmic murmurs produced at the cardiac orifices are rare. Hæmic bruits in the veins of the neck are not uncommon in childhood. Eustace Smith has described a murmur which he regards as of value in the diagnosis of enlarged bronchial glands. The child is made to bend the head back as far as possible, when, if the glands be enlarged, they press on the large veins and produce a constant murmur, audible on auscultation over the manubrium sterni. The sign does not appear to be a very constant one.

The Pulse.—In young infants it is always very difficult to examine the pulse satisfactorily, owing to the restlessness caused whenever the wrist is touched. Hence we always try to feel the pulse before wakening the child. Young infants often tolerate pressure on the fontanelle better than on the radial, and the rate and tension of the pulse can thus be fairly well estimated. Occasionally we need to auscultate in order to ascertain the rate of the heart. The rate of the pulse is (approximately)—

At birth, ...	130 to 140 per min.
At the end of the first year, . .	120 ,,
At the end of the second year, .	110 ,,
At the end of the fifth year, . .	90 to 95 ,,

It must be remembered that both the rate and the rhythm are easily disturbed. Under the influence of excitement an increase of 20 or 30 is common enough, and variations in the intensity and force of the waves are of less diagnostic value than in after life. A relatively great increase in the pulse rate occurs in the feverishness of scarlatina, while in typhoid the pulse may be rather slower than we should expect from the temperature. A slow pulse is found in intracranial lesions, and particularly in cerebral abscess; it also occurs in meningitis, and in some forms of toxæmia—*e.g.*, influenza. In such cases the pulse may be 60 or less, and irregularity in rhythm and force are generally present. Endocarditis and pericarditis usually lead to a rapid, weak, and irregular pulse. The arterial walls are rarely affected, but thickening and even atheroma may occasionally exist. The normal tension of the pulse is low, and the calibre of the vessel is relatively great. The former of these facts depends in some degree on the latter.

EXAMINATION OF THE RESPIRATORY SYSTEM.

Epistaxis, besides being a common result of some local affections, is at times of importance in the diagnosis of general diseases. Of purely local causes the most common are traumata, the presence of foreign bodies, nasal inflammation and ulceration, diphtheria, adenoids, and occasionally polypi. The hæmorrhage comes most frequently from the anterior part of the septum; occasionally its source may be the lateral walls, the posterior nares, or the nasopharynx. Of the constitutional diseases which lead to it, many of the infectious and blood disorders may be mentioned. Thus, frequently enough, it occurs in measles, in the paroxysms of whooping-cough, and in small-pox; if, in the last named, there are also subcutaneous hæmorrhages, the outlook is grave. In later childhood it is commonly found ushering in typhoid fever, and the possibility of this should always be kept in mind if, along with the epistaxis, the child look at all ill. It is much less frequent as a prodromal symptom of the other infectious diseases. In many blood disorders, and especially in scurvy, leucocythæmia, and some forms of purpura and anæmia, epistaxis may be present. It may also result from heart affections, but in childhood is rarely due to Bright's disease. Preceding the bleeding there may be a great deal of lassitude and severe headache, which are often relieved by the hæmorrhage.

Nasal Discharge may be due to coryza occurring alone or with laryngitis and bronchitis. It may be caused by such local conditions as adenoids, polypi, foreign bodies, &c.

Dyspnœa is common, and is due to many different causes. Thus it occurs (just as in the adult) in cardiac disease, in inflammations of the respiratory tract, and in anæmia. In bronchitis and pneumonia an increase in an already existing dyspnœa points to the occurrence of pulmonary collapse. Renal dyspnœa is comparatively infrequent.

The breathing may be hurried and laboured without any special interference either with inspiration or expiration, or there may be difficulty in one or other or both of these. Inspiratory dyspnœa is seen in many conditions interfering with the lumen of the respiratory passages, as for example retropharyngeal abscess, diphtheria, inflammations or tumours of, and foreign bodies in, the larynx, enlarged bronchial glands, spinal abscesses pressing on the trachea, and laryngeal spasm from any cause. Of the last, laryngismus stridulus, pseudo-croup, the spasm following the paroxysm of whooping-cough, and reflex spasm resulting from the presence of adenoids, enlarged bronchial glands, &c., may be referred to. The sudden inspiratory spasm in which a previously healthy child suddenly becomes livid, with upturned eyes and total cessation of respiration, is more particularly alluded to under hypertrophy of the thymus, with which it is generally associated.

Expiratory difficulty is not so frequent as in the adult, but asthma does occur by no means uncommonly. It is seen either as a pure neurosis, or accompanied by enlarged bronchial glands, adenoids, or some other reflex irritant.

Inspiratory obstruction is usually associated with a considerable amount of retraction of the chest walls; expiratory dyspnœa with a distended condition of the thorax.

Orthopnœa is seen in children after the first few years of life. It occurs chiefly in cardiac diseases, and less frequently in nephritis, especially where there is much œdema. In congenital heart disease, dyspnœa, bad enough to cause the child to sit up in bed, may come on at intervals, and, after lasting for an hour or so, pass away, leaving the patient fairly comfortable. Very marked adenoid growths in the pharynx may necessitate the child's head being raised before he can sleep at night. In the ordinary position the patient may start up with a sense of suffocation. In the common type of the disease this is not observed. When a retropharyngeal abscess is present the child usually extends the head very fully in order to allow of the passage of air past the obstruction.

The **voice** and **cry** vary greatly in respiratory diseases. Thus when they are loud and prolonged we may rest assured that there is no extensive bronchitis or pneumonia, for when these are present the child has too much difficulty in maintaining the respiration to permit of a vigorous cry. When the larynx is affected the voice is hoarse, and the absence of this hoarseness may be a favourable sign, and is often of the greatest diagnostic value. In respiratory obstruction, if the voice be clear the lesion is not an inflammatory condition of the larynx; on the other hand, when there is hoarseness or partial loss of voice, the lesion is probably in or near the larynx. Laryngeal diphtheria, laryngitis, œdema and syphilis of the larynx, and occasionally retropharyngeal abscess situated low down, lead to a husky voice and cry; retropharyngeal abscess higher up, enlarged glands pressing on the trachea or bronchi, and pure laryngeal spasm are accompanied by a clear voice and cry. A very rare cause of huskiness is a laryngeal paralysis or new growth. Certain abnormalities of the resonating chambers, such as adenoids and cleft palate, lead to alterations in the voice which are recognisable as soon as the child begins to speak. In older girls aphonia is usually hysterical in origin.

Respiratory stridor is frequently heard in children. In spasmodic laryngitis, diphtheria, and inflammations of the larynx generally, this stridor is very marked, especially with inspiration, but is often heard to a slight degree in expiration also. In laryngismus stridulus and in the "whoop" of pertussis, the inspiratory stridor is extremely marked. A snoring sound may be the first sign of a retropharyngeal abscess, and snoring at night is almost constantly present in cases of adenoids and in enlargement of the tonsils. Growths pressing on the air-tubes below the level of the larynx may also give rise to a stridor—either inspiratory or with both inspiration and expiration. In asthma the prolonged expiratory wheeze is very typical, and may be associated with some inspiratory difficulty as well. Loud stridulous breathing occurring in a newly-born infant and unaccompanied by dyspnœa or alteration in the voice is known as congenital laryngeal stridor.

Cough.—The characters of the cough are of the utmost importance. Thus the paroxysm of whooping-cough ending with the prolonged inspiratory "whoop" and followed by vomiting is characteristic. Occasionally, it must be said, paroxysms of coughing extremely like it occur in enlargement of the bronchial glands and empyema. In young children the typical cough of pertussis is ill marked, and it is in them that it is most closely simulated by the cough of empyema and enlarged bronchial glands. The fact that in whooping-cough it is usually worst at night, and followed by vomiting is sufficient in many cases for the diagnosis. A harsh irritating cough, coming on chiefly as the child goes to bed at night, is frequently seen in tonsillar enlargement, chronic pharyngitis, and especially in elongation of the uvula. In spasmodic laryngitis the cough is usually somewhat metallic in character; in laryngeal diphtheria, on the other hand, it may be toneless. In laryngismus stridulus, and in nearly all affections above and below the larynx, the cough is clear. This sign alone, then, is of great diagnostic value in the differentiation of the causes of inspiratory obstruction. In simple laryngitis the cough as well as the voice is somewhat husky. The cough of pleurisy and pneumonia is short and suppressed, and is followed by crying and an expression of pain. Occasionally, but very rarely, an enlargement of the bronchial glands in which the recurrent laryngeal nerve is involved may produce a husky cough.

Pain in the Chest.—After the first few years of life children often complain of pain in the side when pleurisy or pneumonia is present; frequently enough, however, the pain is referred to the epigastrium rather than the side. Younger children show the pain by crying when pressure is applied to the affected part; the breathing is shallow and the cough suppressed as much as possible.

Expectoration.—In children under the age of six or seven years the sputum is usually swallowed, so that one important diagnostic aid is lost to us. With training, however, children considerably younger than this can be induced to expectorate, and after the age of about seven years the sputum has the same diagnostic value as in the adult.

Hæmoptysis.—This is extremely rare. Even in cases of phthisis it is but seldom met with. It is occasionally observed in mitral disease and in purpura hæmorrhagica, the hæmorrhagic diathesis of the newly-born, and other blood diseases. In the child it is difficult to make certain that the blood has really come from the lungs, and the gums, pharynx, and nose must be excluded as sources of the hæmorrhage before we can look on it as an hæmoptysis.

Inspection of the Chest.—**The shape of the nose** may point to some interference with normal respiration. Thus the pinched alæ nasi with the flattened bridge are seen typically in adenoids. With this there is inability to breathe through the nose, the mouth is kept open, and the face looks heavy and dull. A somewhat similar appearance is seen in enlargement of the tonsils and polypi of the nose. Rapid movement of the alæ nasi points to some implication of the respiratory organs.

The **shape of the chest** should be noted. In rickety children there are swellings at the junctions of the cartilages and ribs (the rachitic rosary), and as the chest wall generally yields somewhat just behind this point, the thorax comes to have distinct lateral furrows while the sternum is pushed forwards. This alteration in form is caused chiefly by the inspiratory yielding of the weaker parts of the chest to atmospheric pressure. In pigeon-breast the chest walls have been compressed laterally. It differs from the rachitic deformity in the absence of the lateral depressions; the sternum is pushed sharply forwards, resembling the keel of a boat, while the outline of a cross section of the thorax is triangular (Figs. 10 and 11). In almost all cases of pigeon-breast and in many of rickety chest a horizontal groove is seen on the antero-lateral aspect of the thorax about the level of the ensiform cartilage. This groove (Harrison's sulcus) is well marked in front, but becomes less and less as it passes outwards, and does not extend further back than the angles of the ribs. The sulcus serves as a line of demarcation between the thoracic and abdominal cavities.

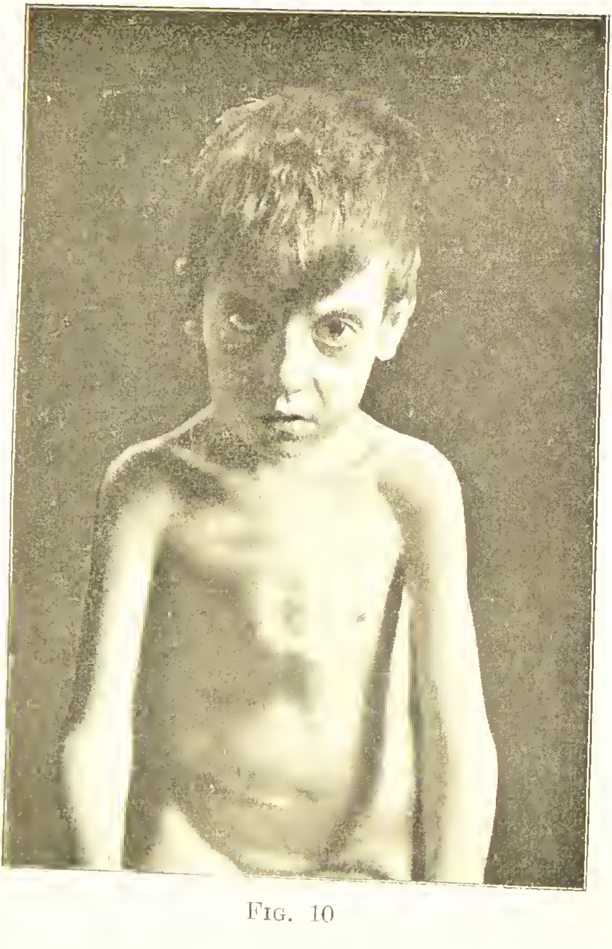


Fig. 10

PIGEON BREAST

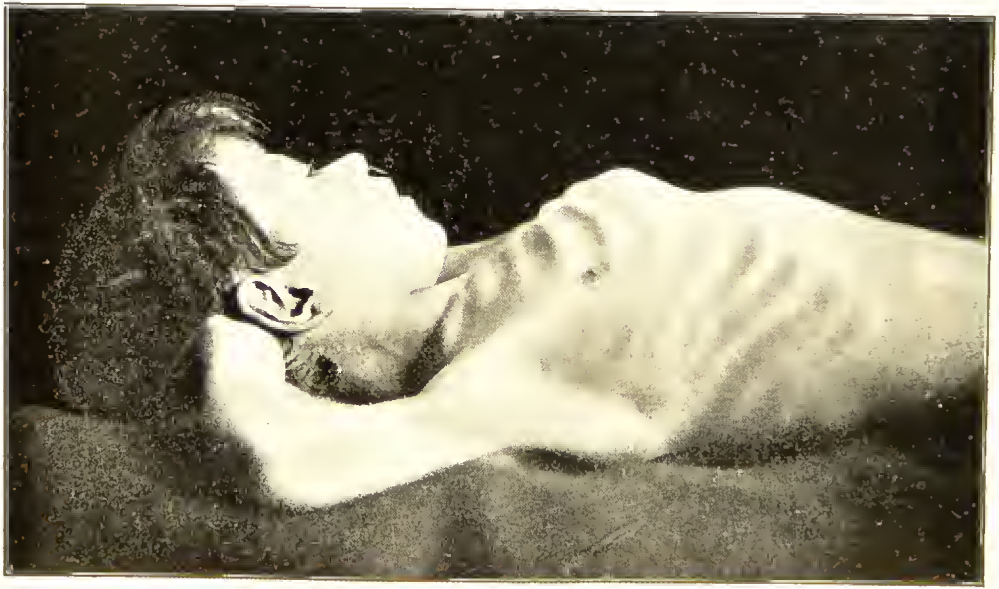


FIG. 11

PIGEON BREAST, SHEWING HARRISON'S SULCUS

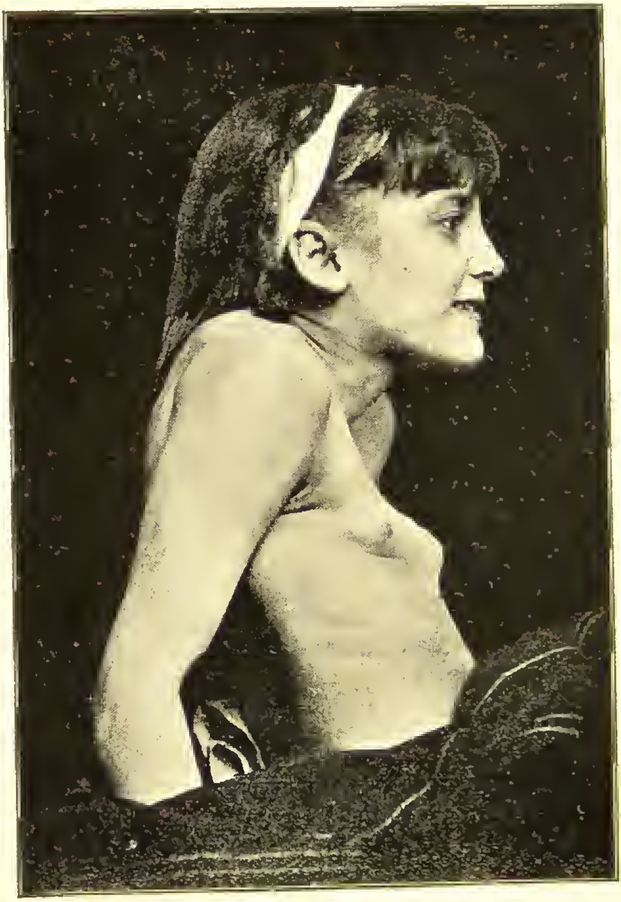


Fig. 13

DEFORMITY OF CHEST FOLLOWING SPINAL DISEASE

The rounded chest of emphysema is not common in children. At times, however, it is seen in association with stooping of the shoulders (Fig. 12). In the funnel-shaped chest there is a marked depression of the lower part of the sternum. It is usually of congenital origin. Disease of the vertebræ often leads to extreme deformity of the thorax, with crowding together of the ribs and displacement of viscera (Fig. 13). Unilateral bulging or retraction is not uncommon. In scoliosis there is practically always a prominence of one side with a corresponding retraction of the other. Pleural effusions, if at all extensive, are almost invariably accompanied by a considerable bulging of the affected side; following pleurisy or long-standing empyema there may be a very marked shrinking of the chest. In cirrhosis of the lung also, the circumference of the affected side is less than that of the other. Supra- and infra-clavicular flattening are not nearly so common as in adults. A marked prominence at the junction of one of the cartilages to the sternum is not infrequently seen; it is of no importance. Sometimes portions of one or two of the ribs on one side are absent. Such defects are commonly accompanied by absence or defective development of the costal portion of the pectoralis major.

As we have already seen, the **respiration** is much more rapid than in later life. This is indicated in the following table:—

At birth it is about	45 per minute.
,, 1 year ,, ,, ...	30 ,,
,, 2 years ,, ,, ...	25 ,,
,, 6 ,, ,, ,, ...	22 ,,

Increased rapidity of respiration is found in so many conditions that it is impossible to enumerate them all; suffice it to say, that practically every inflammation, all affections of the respiratory organs, and many heart and blood diseases are accompanied by hurried respiration. The pulse-respiration ratio is of more importance. Although not perhaps of so much diagnostic value as in the adult, increase in the number of respirations as compared with the pulse-rate points to involvement of the respiratory system. Slowing of the respiration is not very common; it occurs in such cerebral lesions as tubercular meningitis and abscess of the brain.

The rhythm of the respirations is of some interest. Particularly during examination, the pause in the respiratory cycle takes place, not as in adults after expiration, but after inspiration; the rhythm is, therefore—expiration, inspiration, pause.

Cheyne-Stokes' respiration is very common in childhood. It occurs in many cerebral diseases and is seen in young children suffering from broncho-pneumonia. Even in these the prognosis is not absolutely hopeless. The length of the period of respiration varies greatly, as also does that of apnœa, and in slight cases there is scarcely any true apnœa at all, but merely a phase of very shallow breathing. The apnœa is usually associated with increased stupor, with diminution in the rate and tension of the pulse, and with contraction of the pupils. These changes disappear and reappear with the alternating phases of hyperpnœa and apnœa (Fig. 20).

The depth of the respiration is often of great prognostic importance. The onset of shallow and very rapid breathing in a case of bronchitis or broncho-pneumonia is of bad omen; in most instances it is due to pulmonary collapse.

Retraction of the chest wall during inspiration takes place in diseases leading to obstruction of the respiratory passages. The retraction occurs chiefly over the lower part of the thorax, in the supraclavicular regions, and in the episternal notch—the parts, in fact, which are the least supported. This costal retraction always points to some serious obstacle to the entrance of air, and is, therefore, of great diagnostic value. Localised retraction may be observed over patches of collapse.

Palpation.—In children, and particularly in the very young, palpation of the chest gives little information. Vocal fremitus can often only be detected when the child is crying. Tenderness on palpation may be present in rickets, scurvy, pleurisy, and pneumonia, as well as in various traumatic and inflammatory affections of the parietes. In large pleural effusions fluctuation can sometimes be detected. In only one further particular does palpation of the chest differ from what we find in the adult—viz., in pleural effusion. In some of these cases it will be found that even when the effusion is of a considerable size the vocal fremitus is quite distinct; in other cases it is much diminished or entirely absent.

Auscultation.—For the examination of the breath-sounds in young children a flexible (binaural) stethoscope is a necessity. Direct auscultation, the ear being applied to the chest wall, may also be practised. As a rule, when we begin to auscultate, the child holds its breath for a considerable period, and that interval is usually between inspiration and expiration. If the interval be at all prolonged we have a sufficient indication that no very serious disease of the respiratory tract is present. Crying is no hindrance, but rather a help, in auscultation, because it necessitates the patient taking deep gasping breaths in which accompaniments are distinctly heard if present at all.

The respiratory murmur is harsher than in the adult, but is still vesicular in type. Feeble breath-sounds may be due to some obstruction of the bronchi; the most common is blocking with a plug of mucus which is removed as the child cries. Abnormal feebleness of the sounds is also occasionally present over atelectatic portions of lung. It not infrequently happens that when a child is lifted to be examined the breathing at the bases posteriorly is found to be very faint and perhaps accompanied by a sharp crepitation at the end of inspiration. These signs disappear after a few deep breaths and are evidently due to some of the vesicles at the base of the lung not being distended with air; as the child is lifted from the recumbent posture they become inflated and the peculiar sharp crepitations are produced. In rickets the breath-sounds over the lower part of the chest may also be deficient. This is partly due to the presence of collapse, partly to poor muscular development and feeble respiratory movements, and partly to the deformity of the chest so commonly present not allowing of the proper expansion of the lung. Faintness of the respiratory murmur likewise occurs in thickening of the pleura, which is in children so commonly associated with pneumonia.

Sometimes the first indication of consolidation is given by abnormal loudness of the breath-sounds over the affected area. On the other hand, the facility with which the sounds produced in one lung are conducted to the other is apt at times to mislead us, and to make us suppose that they are produced in the part of the lung over which they are heard.

Tubular breathing is very common in children, and in the vast majority of cases is due to a pneumonia, but is frequently enough present over a pleural effusion. It is found both in croupous pneumonia and in the catarrhal form, provided that the latter be present in a sufficiently large patch. As both forms of pneumonia occur most frequently at the posterior bases, it is here that tubular breathing is usually heard. But we must auscultate not only the bases but the apices (where croupous pneumonia is relatively common), the vertebral and axillary margins of the lungs, the lingula on the left side, and the extreme anterior and inferior part of the right lung. In all these positions patches of broncho-pneumonia are likely to be found. They are often of a triangular shape with the apex pointing towards the root of the lung. The breath-sounds over a pleural effusion are usually loud and of a distinctly "whiffing" tubular character. They are, therefore, very like those of pneumonia, but the somewhat nasal quality of the sound may be sufficiently characteristic to lead to a diagnosis. At times, however, especially in older children, the breathing over an effusion is distant or even inaudible. Causes of tubular breathing other than pneumonia and pleurisy are rare in childhood.

Like the fremitus, the vocal resonance is of less value in the young than in the grown-up person. It is often very marked even in large pleural effusions, and so is apt to lead to the supposition that consolidation is present. Œgophony may be heard in such cases, but nasal resonance is also observed in the early stages of some forms of pneumonia. A distinct stridor may be heard with the breath-sounds. It should be noted whether it accompanies inspiration or expiration. In the latter case it may be due to enlarged bronchial glands, abscesses pressing on the trachea, and the like.

Percussion of the chest should always form the last step in the examination. The chest walls of the infant are thin; therefore only a light stroke is necessary. The limits of the lungs correspond pretty closely with those in the adult, so that deviations from the normal are readily detected. On the anterior surface of the chest of a healthy child a cracked-pot sound is easily elicited by moderately strong percussion; it has no pathological significance. The physical conditions of the lungs giving rise to dulness are the same as in the adult, but as small patches of pneumonia are frequently surrounded by areas of emphysema, they are apt to elude observation. The sense of resistance is of great practical value. The resistance of a pleurisy with effusion is much greater than that of a pneumonia, and as we have already seen that the signs afforded by auscultation and percussion are often very similar in the two conditions, this becomes of great importance in the differential diagnosis. Not only the bases, but also the axillary regions and the interlobar lines, must be examined carefully for effusions, and on the left side there may be an area of dulness contiguous to that of the heart, or in Traube's area.

Exploratory puncture is advisable whenever there is the possibility of an effusion, although the signs may be much more suggestive of an area of consolidation. The needle should be one of fair calibre, so that it may not too easily become blocked with pus. A fine needle will often give misleading information by failing to draw off fluid, even though the chest be filled with a large effusion. The syringe should be inserted over the centre of the area of dulness, and if the first puncture be negative, we try in one or two different spaces before being satisfied that there is really no fluid.

EXAMINATION OF THE URINARY SYSTEM.

Temporary anuria is not uncommon during the first twenty-four, and it may be thirty-six or even forty-eight hours of life. This is apt to give the mother or nurse some anxiety, and to lead to the administration of diuretics. We may therefore explain that such a delay in micturition is quite normal, but if after forty-eight hours no urine appear, the urinary passages must be examined to see if any abnormality be present.

There is often **increased frequency of micturition**, particularly in stone in the bladder, and in all conditions accompanied by irritation of the vesical mucous membrane. Thus where the urine is highly acid, or contains pus or blood, the child will pass water oftener than usual. Increased frequency of micturition may occasionally be due to abnormalities of the prepuce, rectum, &c.

Difficulty in micturition is very frequent, and is practically always associated with pain. In young children it is usually due to hyperacid urine or to the presence of fine gravel. The child cries out, draws up its legs, strains, and is exceedingly restless—symptoms which are often ascribed to intestinal colic. It will be noticed, however, that relief is got after the passage of water, whereas in colic it follows movement of the child, or the passage of flatus or fæces. Phimosis is another very common cause of dysuria, and in all cases where there is any urinary trouble the prepuce should be carefully examined. Adhesions between the foreskin and the glans, with accumulation of smegma in the coronary sulcus, and perhaps some resulting balanitis, will often be found. In children in whom the dysuria has lasted for some time, the prepuce may be elongated from being constantly pulled at. The remaining common causes of dysuria are stone, pyuria and hæmaturia, rectal ulceration, &c., and (in girls) vulvitis.

Incontinence of Urine.—Control of the act of micturition does not exist before the second year or so. After this time, however, power is gradually gained, and when incontinence remains at a much later age it is to be regarded as pathological. In such cases we must find out whether the incontinence occurs only at night, or whether it is also present during the day; and if it exist during the day, whether it comes on when the child is at rest or only when it is running about. In some cases enuresis is associated with involuntary evacuation of the bowels. It is important to learn whether the incontinence has always existed, or whether after some degree of control had been acquired it was again lost. We should further examine for other signs—motor, sensory, or mental—of nervous affection, the spinal column should be investigated, and a search made for lesions of the genito-urinary tract and also for peripheral sources of irritation.

Slight dribbling of urine, not amounting to actual incontinence, is frequently associated with vesical calculus and other lesions of the bladder and urethra.

The physical examination of the genito-urinary system consists of (1) the examination of the genito-urinary organs; and (2) the examination of the urine.

1. GENITO-URINARY ORGANS.

Kidneys.—In healthy children the kidneys can often be felt by careful palpation with one hand in the loin and the other in front. In many conditions of enlargement the outlines of the organs can be both seen and felt. When they attain a considerable size, as in some forms of renal tumour, the kidneys may fill a large part of the abdominal cavity. On palpation the tumour moves slightly, if at all, with respiration; it may be firm to the touch—in sarcoma, some forms of tuberculosis, pyelitis, &c.—or may fluctuate, as in hydro- and pyonephrosis. As a rule, the outline of the mass is distinct, but in perinephric abscess the opposite is the case. Tenderness may or may not be found. In tumours and hydronephrosis it is generally absent, but in pyelitis and pyonephrosis it is usually present.

On percussion in cases of renal enlargement a band of resonance due to the presence of the colon is found running in front of the tumour. In exceptional cases this may be absent if the bowel have been pushed aside or compressed between the tumour and the abdominal wall. Inflation of the colon may restore this zone of resonance. Splenic tumours do not give the sign in question. By percussing posteriorly, renal dulness is found to reach up to the spine, whereas in enlargement of the spleen there is nearly always a resonant area between the spinal column and the tumour.

Bladder.—Distension of the bladder is readily made out by percussion and sometimes by palpation. On palpation, too, tenderness over the pubes can be elicited in vesical catarrh. To examine the bladder more carefully we place one finger in the rectum and a hand over the hypogastrium; much information as to the condition of the bladder walls, the presence of a stone, &c., can be obtained in this way. Whenever a calculus is suspected the child should be sounded under an anæsthetic. The passage of a sound or catheter in a female infant is a matter of some difficulty, as the instrument is apt to pass into the vagina. The operation should be performed with great gentleness and in a good light.

The **prepuce** frequently requires to be examined. In many cases it will be found that it cannot be retracted, but usually, after adhesions have been broken down by sweeping a probe round between it and the glans, we are enabled to draw it back and to remove the smegma and concretions which have collected. The mother should then be instructed to pull the foreskin back and clean the glans daily.

The **vulva** rarely requires to be examined except on account of discharge, inflammation, ulceration, &c. Films may be made from any pus found, and examined for the presence of the gonococcus.

2. URINE.

Quantity.—As the urine is passed involuntarily in early life there is often some difficulty in obtaining a specimen, and, save under exceptional circumstances, catheterisation should not be employed. With care a sample can generally be procured by placing a pad of simple absorbent wool over the meatus, and squeezing out the urine which collects in the course of an hour or two. Various forms of receptacle for both boys and girls have been devised, where accurate measurement and analysis of the urine is wished. The average quantity of urine passed at different ages will be found in the chapter dealing with physiology.

The two chief causes of polyuria—viz., diabetes mellitus and cirrhotic Bright's disease—are rare in children; waxy kidney is, however, common. Diminution in the quantity of urine occurs in the same conditions as in the adult.

Albuminuria.—During the first days of life, albumin, and sometimes renal epithelium, are present. Unless persisting unduly they are of no significance. Besides this normal albuminuria a so-called "cyclic" form may occur. A family history of Bright's disease or gout may be obtained, and it is probable that in some at least of these cases the condition is really one of incipient cirrhotic kidney. About adolescence, too, a functional albuminuria is sometimes observed; it completely disappears in most of the cases. Pathologically, albumin appears in the urine in the same conditions as in the adult.

Hæmaturia is not uncommon in children. It may occur in blood disorders, as in the hæmorrhages of the newly-born, in purpura, in scurvy, &c., and is also a symptom of the hæmorrhagic forms of infectious diseases. It is sometimes found in Bright's disease and in malaria, and is an important sign of tumour of the kidney. It may also be caused by calculus, by pyelitis, and by the use of such drugs as turpentine, cantharides, and chlorate of potash. In addition to all these we occasionally find a recurrent form without any organic lesion being discoverable ; this is known as "cyclic," or "idiopathic," hæmaturia. Hæmaturia is frequently associated with the presence in the urine of pus, as in calculus, tubercle, pyelitis, &c. ; in all such cases careful examination of the deposit (preferably after centrifugalisation) for tubercle and other bacilli should be made

Hæmoglobinuria occurs as a result of poisoning by certain drugs, of which carbolic acid is the most common ; as an infectious (?) disease of the newly-born ; and in other conditions. It is very rare.

Indicanuria.—A great deal has been written about the presence of indican in the urine of children. It would appear that it is usually absent in healthy breast-fed infants, and that (though it undoubtedly may be a sign of albuminous decomposition in some part of the body) its presence is of no great diagnostic value.

Diaceturia.—Diacetic acid in the urine is an evidence of auto-intoxication, and in the adult the prognosis is grave. In childhood diaceturia seems to be comparatively common, but not to have the same prognostic significance.

Glycosuria.—A purely alimentary glycosuria may occur in breast-fed infants when digestive disturbance is present. True diabetes mellitus is uncommon.

Casts, crystals, pus, and (in icterus neonatorum) the so-called "masses jaunes" may also be found in the urine.

CHAPTER IX.

DIAGNOSIS (*continued*)—NERVOUS AND LOCOMOTORY SYSTEMS.

Contents.—Examination of the Nervous System: **I. Cranium and Spine**—Enlargement of the Cranium—Small Cranium—Asymmetry of the Skull—Movements of the Fontanelle—Spinal Column—Lumbar Puncture—**II. Mental Condition**: **Speech**—**III. Sensory Functions**: Eye—Ear—**IV. Motor Functions**: Organic Reflexes—Deep Reflexes—Involuntary Movements—**V. Trophic Functions**—**Examination of the Locomotory System**: Joints—Epiphyses—Shafts—Muscles.

EXAMINATION OF THE NERVOUS SYSTEM.

THE examination of the nervous system in the child is carried out on exactly the same lines as in the adult. It is, however, a less elaborate matter, partly because the functions are less specialised, and partly because the co-operation of the patient, so necessary for the investigation of certain functions, cannot always be secured.

I. CRANIUM AND SPINE.

The principal alterations in the size of the head have been alluded to under the general examination. Slight variations can only be detected by comparison with the normal standard.

Enlargement of the cranium occurs in its extreme degree in hydrocephalus, and to a less extent in rickets. The shape is not quite the same in the two conditions; in the former the skull is dome-like, and this, together with the down-turned eyes, is sufficient to distinguish the hydrocephalic skull from the square head of rickets. It will be remembered that the two diseases may be combined.

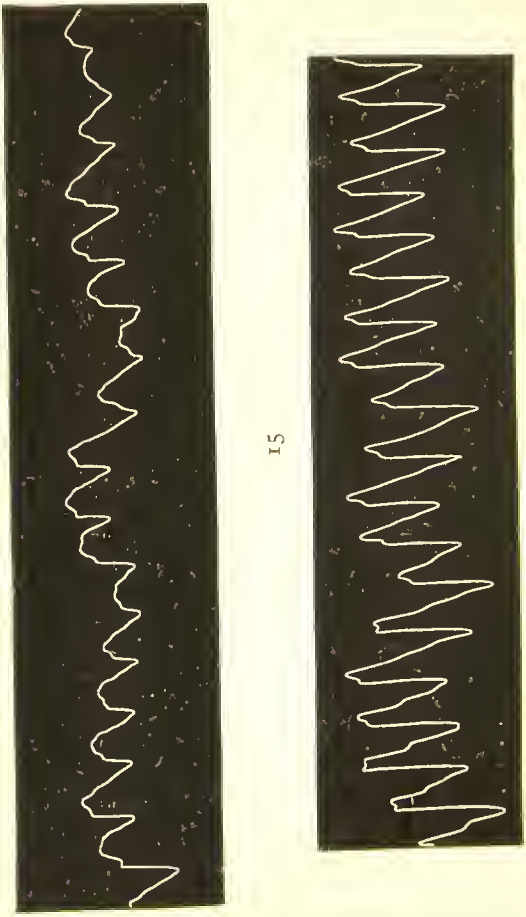
In other cases the skull may be **abnormally small** and of somewhat conical appearance; to this the name of "microcephaly" is applied. The patients are idiotic, and have a curious bird-like appearance. In place of being uniform, the deficiency may involve only the back of the skull. This is seen in Mongol idiots. The normal outline of the skull may also be departed from without any pathological condition of the brain being present. Thus some children are more dolicho-cephalic, others more brachy-cephalic in type. We may, however, find other defects with these deviations; the cretin, for example, has a brachy-cephalic skull.

Asymmetry of the skull may also be seen. The deformities produced in parturition are well known, and of some obstetrical interest. Apart from these, which are soon remedied, the skull may be permanently asymmetrical. This occurs in idiocy, in some cases of infantile cerebral paralysis, and in children who, though fairly normal mentally, are the subjects of developmental defects in other respects. Local swellings are not uncommon. At birth, or soon after it, we may find a large fluctuating swelling whose outline is sharply defined by one of the parietal bones. This will readily be recognised as a cephalhæmatoma. When nervous symptoms co-exist with an external cephalhæmatoma we may suspect that blood has been effused inside as well as outside the cranium. The only tumours of the head likely to occur in childhood are the hernial protrusions known as meningocele, encephalocele, and meningo-encephalocele. They are usually mesial in position, or, if lateral, lie in the regions of the orbit and parietal bone. They show signs of communication with the inside of the cranium—they pulsate, give an impulse on coughing, and, if reducible, will often cause cerebral symptoms as they disappear.

On palpating the skull we may find areas in the occipital region where the bone feels thin and soft and crackles to the touch. Such spots are known as craniotabes and are characteristic of rickets. They are often well marked about the lambdoidal suture, and are uncommon after the twelfth or fourteenth month.

A general sensitiveness of the skull to percussion is found in most acute intracranial diseases. Percussion may also prove of assistance in the diagnosis of tumour and abscess. Direct percussion with one finger over the parietal region, the patient being held upright the while, is the method advised. Normally the note is flat in infants; as the intracranial pressure rises it becomes more resonant. Increased resonance, along with signs of tumour, is said to indicate involvement of the cerebellar fossa, and distension of the ventricles (*Macewen*).

Movements of the Fontanelle.—The degree of the bulging and the extent of the movements of the fontanelle can be roughly appreciated by the hand, but it is only by the use of the graphic method—by taking tracings—that many of the more important points can be ascertained. These tracings may either be taken by a Marey's sphygmograph, which yields very good results, or by a cardiograph. It is advisable at the same time to take tracings of the respiratory movements, which can most easily be done by fixing over the epigastrium a tambour connected with a lever writing on the cylinder immediately below the fontanelle tracing. In many cases it requires a great deal of tact to prevail upon the child to keep still while the tracings are being made, hence it is often advisable to try and get them during sleep. In order to appreciate thoroughly the results obtained it must be understood (1) that the venous side of the circulation in the brain is of the greatest importance, and (2) that from the fact that during inspiration blood is freely aspirated into the chest from the veins of the neck, whilst in expiration this flow is checked very considerably, the movements of respiration have a very powerful influence on the intracranial circulation. The result of this is that during inspiration the pressure is so decreased that the fontanelle falls in, while during expiration it bulges. These respiratory movements can be felt by the hand, but are better shown in the tracings (Figs. 14, 15, and 19). But, besides these, movements take place with arterial pulsation. Each arterial pulse shows three waves, the second of which is the highest. The arterial pulsations are therefore anacrotic, not katacrotic, as in the usual pulse. The characters of the tracings vary under several conditions :—(1) As regards the respiratory waves, the higher the intracranial tension the smaller do they become, because the respiratory movements have naturally less influence in such a condition. So, too, the less ample the respiratory movements, the smaller are the waves produced. If pressure be applied to the veins of the neck, by bending the head forward or by



14

15

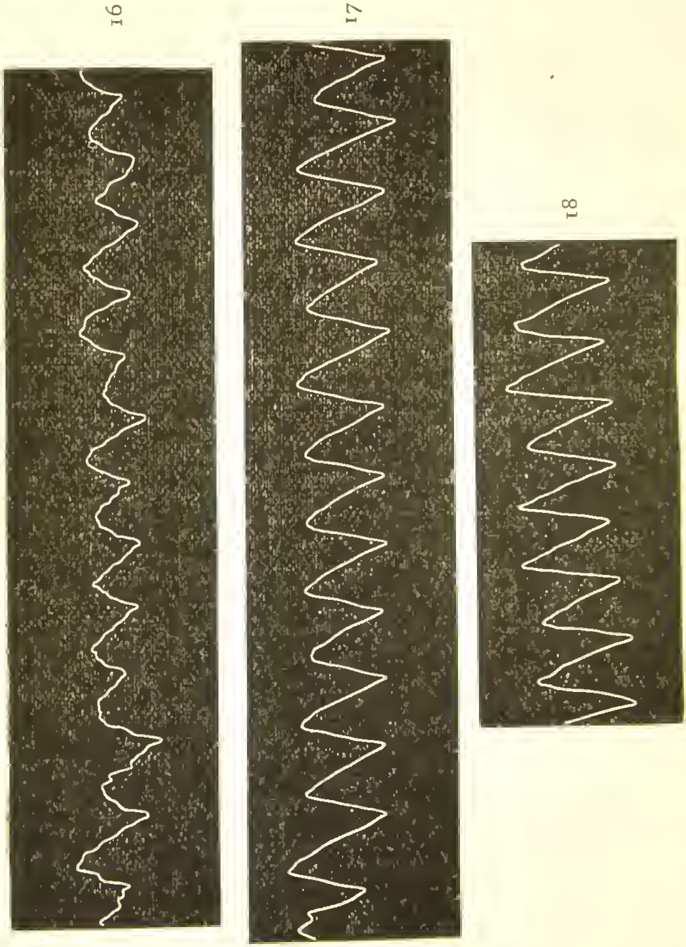
Figs. 14 and 15.—Normal Fontanelle Tracings, showing respiratory undulations, and anacrotic character of individual pulse waves.

applying a constricting band, the respiratory movements of the fontanelle cease. (2) The arterial waves vary according to the intracranial tension. As it increases the fontanelle bulges more and the level of the tracing is raised. The intracranial pressure may be raised either by increased venous pressure or (less frequently) by increased arterial pressure inside the skull. Therefore all conditions leading to rise in the general venous pressure—movements, coughing, &c.—cause a marked bulging of the fontanelle, and anything interfering with the outflow of blood through the jugular veins brings about a similar increase of the intracranial pressure. In such cases, along with a rise in the general level of the tracing, the individual waves become less ample and more rounded, preserving their anacrotic character (Fig. 14). Diseases leading to effusion inside the skull also give rise to increase of pressure, and in them the pulse waves are similarly affected. Such conditions act on the intracranial circulation largely by interfering with the outflow of blood, for, the intravenous being less than the intra-arterial or the capillary pressure, the veins are the most easily compressed. But a rise of intracranial pressure may occur from the arterial side. Although almost all recent investigation has tended to show that there are no nerves from the general vasomotor centre to the intracranial arteries, yet that centre can bring about an increased intracranial circulation by contracting the other arteries of the body, and by lessening the capacity of the splanchnic venous area. Conversely, causes which lead to general arterial dilatation will produce comparative cerebral anæmia with sinking of the fontanelle. Depression of the fontanelle also occurs in cases of general anæmia and especially in diarrhœa in children, when we see the sunken fontanelle of the so-called "hydrencephaloid" condition. But although, as a rule, the intracranial arterial pressure is affected through the influence of the general systemic circulation, and is, we may say, at the mercy of the general circulation, a rise of pressure seems in some cases to occur independently of this. Thus in mental excitement there is a rise in the level of the tracing, and associated therewith the waves tend to become higher and katacrotic. When amyl nitrite is inhaled a similar rise and tendency to katacrotism also occur.

During sleep (Fig. 16), the mean intracranial pressure being low, the respiratory undulations are well marked and the individual pulse waves are low. In chloroform anæsthesia a practically identical state of matters is observed. When the child is in the recumbent posture the fontanelle is tense, the respiratory and arterial waves are less ample, and the latter more rounded than in the vertical position. All kinds of movement raise the intracranial pressure, and the arterial waves become smaller. In Cheyne-Stokes' respiration the movements of the fontanelle correspond exactly in rhythm with the variations in respiration, increased pressure occurring along with the periods of hyperpnœa, decreased pressure during apnœa (Fig. 20).

Looking at the purely clinical side, depression of the fontanelle is met with in conditions of intracranial anæmia after hæmorrhage, severe diarrhœa, &c., during sleep, in chloroform narcosis, and in other conditions. With the depression of the fontanelle the pulse waves are small, and the respiratory undulations well marked.

Undue bulging of the fontanelle is caused by (1) increased venous pressure, as during movement and crying, or from growths in the neck; (2) general backward pressure, as in severe bronchitis, pneumonia, cardiac disease, &c., provided that the arterial tension be fairly well maintained; (3) exudation, growths, &c., inside the skull; (4) vasomotor stimulation with resulting contraction of the systemic vessels; (5) occasionally, independently of this, as in mental action and on the inhalation of amyl nitrite.



Figs. 16, 17, 18.—Normal Fontanelle Tracings, (16) during sleep, (17) awake, lying down, and (18) awake, sitting up. (Taken from the same patient within a few minutes).

It must be remembered that the amount of intracranial pressure is no guide as to the state—healthy or otherwise—of the intracranial circulation. What determines this is the presence of a satisfactory flow of blood through the brain. The pressure at which it is flowing is, within wide limits, of little moment. For this flow it is necessary that there should be a considerable difference between the arterial and venous pressures, that there should be no interference to the outflow or to the capillary circulation, and that the cerebrospinal fluid should be able to escape freely into the venous channels by which it chiefly passes out of the cranium.*

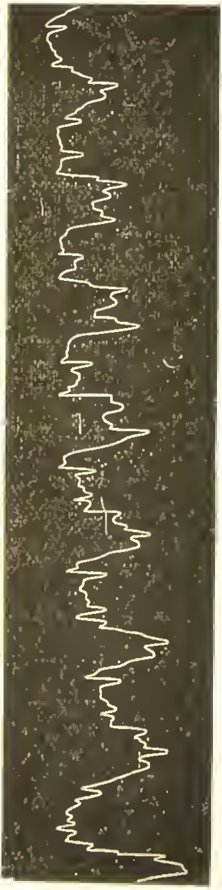


Fig. 19.—Fontanelle Tracing from an Infant six weeks old; taken while under chloroform. Respiratory undulations very marked; arterial pulse waves indistinct. (Figs. 14 to 19 read from left to right.)

Spinal Column.—Scoliosis and kyphosis occur in rickets; the former may also be secondary to contraction of one side of the thorax, to old hip disease, or, in older children, to weakness of the muscles apart from rickets; the latter may be due to caries of the spine. The distinction between Pott's curvature and rachitic kyphosis is made by attending to the age of the patient—under two years rickets is more probable; acuteness of the angle and the presence of rigidity are in favour of Pott's disease. In caries, too, paraplegia and abscess may develop; while in rickets, though a pseudo-paresis may occur, the limbs never entirely lose power. In rickets, when the patient is laid on his back the curvature diminishes, when he is raised by the arms it entirely disappears. Lordosis is seen in rickets, pseudo-hypertrophic paralysis, congenital hip disease, and cretinism. Pain in the spine may be tested for by pressure over the part and by downward pressure on the shoulders; rigidity is discovered by asking the patient to bend. Sensitive spots along the spine are not common. They may occur in caries, hysteria, and, perhaps, chorea. Rigidity and retraction of the upper part of the spine and neck are seen in all kinds of meningitis of the base, particularly in the simple basal form. In the last named and in tetanus true opisthotonos may be present. Fixation of the head is also found in caries of the cervical vertebræ, in muscular rheumatism, and in osteo-arthritis. A spina bifida will

---

* For further information on this subject, *see* Hutchison and Elder, "On the movements of the Fontanelle in Children," *Edin. Hosp. Reports*, vol. iii., 1895; and Elder, "The Intra-cranial Circulation in some of its aspects," *Brit. Med. Journ.*, Nov. 13, 1897.

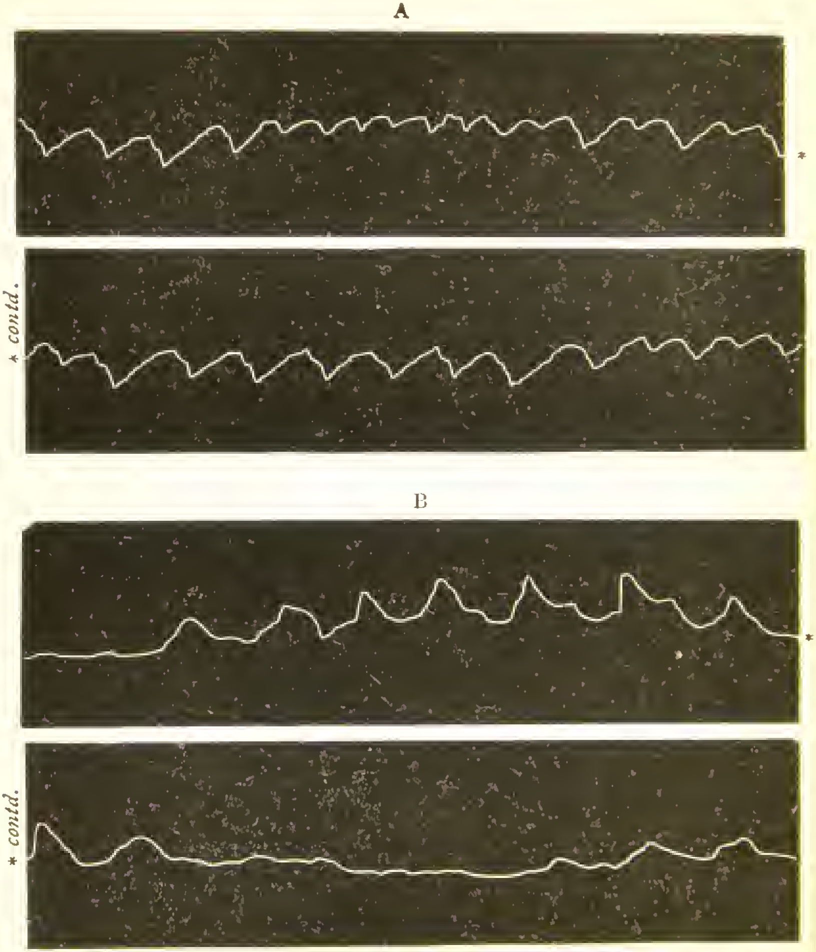


Fig. 20.—Fontanelle Tracing from a case of tubercular meningitis with Cheyne-Stokes' respiration. A, Tracing from Fontanelle. B, Tracing from Respiratory movements. (Fig. 20 reads from right to left.)

easily be recognised by the presence of the characteristic swelling, usually in the lower part of the column. In spina bifida occulta the deficiency of the vertebral arches can easily be detected, and the skin of the part is generally hairy. In some children a dimple—the post-anal depression—is seen just below the end of the sacrum.

Lumbar Puncture.—The patient is laid on his side and the body bent forwards so as to render the lumbar spine convex. The needle is entered between the 3rd and 4th vertebræ—a little above a line joining the highest points of the two iliac crests—just outside the middle line, and directed upwards and inwards between the laminæ. We note the pressure under which the cerebro-spinal fluid escapes; if it run out in drops the pressure is about normal, but if in a continuous stream, it is unduly high. Coagulability of the fluid points to an inflammatory condition. Normally there is little albumin; in cases of meningitis it may be as much as 4 per cent., in hydrocephalus, from 0·4 to 0·8 per cent. The most valuable diagnostic feature is the presence of foreign substances. Blood in any quantity suggests a meningeal hæmorrhage; if pure, it probably comes from a spinal vein which has been punctured by the needle. Pus is indicative of a purulent meningitis. The bacillus of tubercle, the diplococcus of Weichselbaum, the pneumococcus, or the staphylococcus, may be present.

II. MENTAL CONDITION—SPEECH.

The investigation of the intelligence of the patient has reference chiefly to backwardness or imbecility, and need not further detain us here. In the examination of the nervous system we rely as little on subjective and as much on objective tests as possible, and hence are not to any great extent dependent on the intelligence of the patient. We note in passing, however, whether the child seems of ordinary ability, whether he is cleanly in his habits, recognises his parents, plays naturally, is good tempered or irritable, and whether he can read or write. Certain illnesses are characterised by fairly definite mental states. The emotional frame of mind of the choreic patient, the irritability of one suffering from an acute cerebral disease, will readily occur to mind. Delirium is not extremely frequent, but may be seen in the course of an acute illness. A special form of delirium with hallucinations is not uncommon—the ordinary night terrors of children. Hallucinations of sight and hearing may occur in the early stages of meningitis; occasionally an epileptic aura is of the same nature. More closely allied to the psychoses than any of the preceding, imperative concepts, which are sometimes observed in childhood, may be mentioned.

The examination of the function of speech in children is difficult. Absence of speech is often due to defective development of the higher parts of the brain. True aphasia is almost always motor; it is often temporary and may occur in convalescence from acute illnesses. Hurried, irregular articulation is noticeable in severe chorea. In Friedreich's disease and multiple sclerosis the speech is scanning. Stammering and stuttering are very common in children.

III. SENSORY FUNCTIONS.

It is practically useless to attempt to differentiate between disturbances of the various forms of sensibility—heat, cold, pain, touch, and the like; all we can do is to find out whether pricking is felt or not. It is obviously futile to investigate the sensory functions of comatose or semi-comatose children, or of those with signs of cerebral irritability. With these reservations the examination is carried out on ordinary lines.

Sensation is intact in the dystrophies, in cerebral paralyses, in infantile paralysis, and in the later stages of peripheral birth palsies.

In paraplegia from Pott's disease it may be impaired or absent. In post-diphtheritic paralysis it is either normal or slightly impaired; it appears to be interfered with in the earlier stages of birth palsies affecting mixed nerves. Headache may be due to very many different causes. The most important are overwork at school, anæmia, dyspepsia, refractive error, and organic brain disease. We have to ascertain whether there is any local tenderness, and whether the headache has any resemblance to migraine.

Eye.—Visual defects do not concern us except in so far that the absence of sight is an early sign in some cases of idiocy. After a few weeks an infant should follow a bright light with the eyes. Variations in the size of the pupil, in the light-reflex, in the reaction to accommodation, and in the visual fields, have much the same significance as in later life, but, as many diseases giving rise to them are rare in childhood, they are less commonly seen than afterwards. In post-diphtheritic paralysis the pupils are dilated or normal; accommodation is usually paralysed. The most common contraction of the visual fields is hemianopsia, occurring in cerebral paralysis. Strabismus, either concomitant or paralytic, may be present. The former is common in hypermetropia and develops when the child begins to make frequent demands on its accommodation, as when the first lessons are learned, from the age of three to six years (*Berry*). The latter is often seen in meningitis and other cerebral lesions. The two may be distinguished by the fact that when by occluding the sound eye the squinting eye is made to fix an object, in concomitant squint the secondary deviation is equal to the primary, in paralytic squint it is greater. Nystagmus is seen in cases of hydrocephalus, in some forms of cerebral paralysis, in Friedreich's disease, and in other conditions. An interesting example is its occurrence in spasmus nutans. While the head moves the eye may remain at rest, but when it is fixed by the hand nystagmus begins. It also accompanies choroiditis and other fundal changes. Occasionally, transient nystagmus, for which no very satisfactory explanation can be given, is observed. Congenital ptosis is sometimes seen, and so are such defects as coloboma and microphthalmos. Proptosis may occur in scorbutus, here it is associated with effusion of blood beneath the skin of the upper lid. It is also observed in thrombosis of the cavernous sinus, in tumours of the eye and orbit, and in Graves' disease. The ophthalmoscopic examination of the eye is difficult in childhood, and we have usually to be satisfied with a passing glance at the disc. The chief morbid appearances of importance are optic neuritis and tubercle of the choroid. The latter (which is rarely found) is pathognomonic of tubercular meningitis or general tuberculosis. In the rare disease known as amaurotic family idiocy the cherry-red spot at the macula is characteristic. Among other fundal changes met with in the young we may mention intraocular tumour, choroiditis, and retinitis pigmentosa.

Ear:—The sense of hearing is examined in the usual way. The most common cause of nerve-deafness in children is epidemic cerebrospinal meningitis. Deaf-mutism may also occur; if deafness be congenital a history of its occurrence in near relatives must be sought. The occurrence of otorrhœa is so common that the examination of the ears is almost a matter of routine. No speculum is as a rule needed, the auricle is simply drawn backwards and upwards, and the light thrown in by an ear mirror. Foreign bodies, polypi, and perforations of the tympanum are common. The discharge may be fœtid and scanty; in such a case the condition of the mastoid requires investigation.

IV. MOTOR FUNCTIONS.

Organic Reflexes.—Swallowing is interfered with in a number of different conditions. Regurgitation of food may occur in purely local lesions such as retropharyngeal abscess and diphtheria of the palate. It is very common in post-diphtheritic paralysis. Nevertheless in tubercular meningitis the power of swallowing often persists after the other organic reflexes are abolished. The movements of the laryngeal muscles are sometimes disturbed. A post-diphtheritic aphonia may occur. Spasm is seen in congenital laryngeal stridor, in laryngismus, and in pseudo-croup. The sphincters of the rectum and bladder may not come under the control of the will until a somewhat late period; from this, incontinence of fæces and enuresis result. The latter is usually nocturnal. In all such cases a reflex cause should be sought. The incontinence may also be due to backward mental development or to malformation of the spinal cord.

Deep Reflexes.—As the ligamentum patellæ is narrow we must test the knee-jerks carefully, lest by missing the ligament we fail to elicit the jerk, and conclude that it is absent. The general significance of the deep and cutaneous reflexes is much the same as in later life. The tendon jerks are markedly increased in cases of spastic cerebral paralysis, especially in the diplegic form. Paraplegia is most commonly seen in Pott's disease of the vertebræ, in hydrocephalus, and in cerebral paralysis. It may be either flaccid or spastic, but, on the whole, there is usually a considerable degree of spasm, and in some diplegias the spastic rigidity is very great.

Paralysis of several extremities, monoplegia, or paralysis of a group of muscles, may result from acute anterior poliomyelitis; the paralysis is atrophic, and the extent to which the reflexes are involved is dependent on how far the muscles necessary to their production are affected. In the muscular dystrophies the paralysis is symmetrical, and affects the legs, the legs and arms, the arms, or the arms and face; the muscles of the back are involved later. Paralysis of one arm may be due to pressure on the brachial plexus at birth; facial palsy may arise from a similar pressure on the facial nerve. A slight degree of paresis is often seen in chorea. As opposed to these nervous disturbances a pseudo-paralysis may occur. The chief forms of this are syphilitic pseudo-paralysis, post-rachitic pseudo-paralysis, and the paralysis of scorbutus.

Involuntary movements form an important group of nervous disturbances. Some of them have been mentioned in treating of the general examination. Thus chorea, tetany, tetanus, habit-chorea, and spasms of various kinds, all have their characteristic motions. Facial spasm, or blepharospasm, is occasionally associated with stammering. Besides taking place in chorea, choreiform movements occur in Friedreich's ataxia; hemichorea may follow hemiplegia, or bi-lateral post-paralytic chorea, diplegia. Athetosis and forced and associated movements are also seen in a few cases of cerebral palsy. Tremor is uncommon in childhood; it is seen in Friedreich's disease and in a few cases of cerebral tumour. It occurs as a temporary symptom in some ill-nourished children.

Spasms and contractures are chiefly observed in cerebral paralysis. They occur both in the hemiplegic and the diplegic varieties, but are more marked in the latter. In the most typical form—general spastic rigidity—we have the condition known as Little's disease. A spastic condition of the legs—even amounting to complete crossing—may, however, be of spinal origin. A peculiar form of clonic spasm of the head, either rotatory or vertical, is seen in spasmus nutans of young infants. It is associated with nystagmus, and may to some extent depend on the eruption of a tooth. Complex co-ordinated movements occur in hysteria, in some forms of so-called "habit chorea," and in tic convulsif.

Convulsions are extremely common in childhood. We note their general character, and especially whether they are uni- or bi-lateral; in the former case a central cause is probable. Convulsions taking place immediately after birth are usually due to meningeal hæmorrhage; in these cases, should the patient survive, the picture of cerebral paralysis may develop later. Epileptiform seizures are common in all stages of cerebral paralysis; as time goes on the condition of true epilepsy—aura, post-epileptic stupor, petit mal, &c.—is more and more nearly reached. Convulsions are also seen in the early stages of infantile paralysis, in hydrocephalus, in meningitis (where they may be general or localised), in tumour, and in many constitutional diseases and local lesions of peripheral parts of the body.

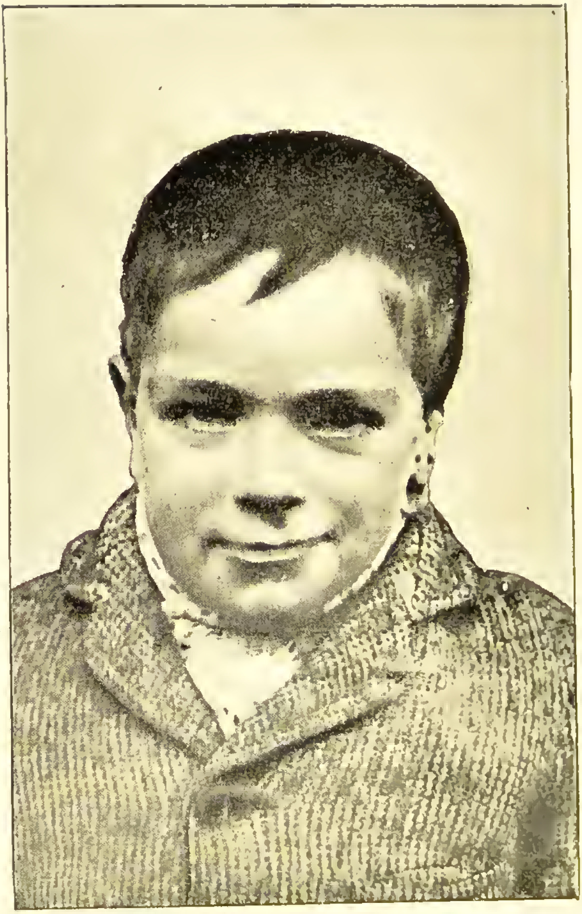


FIG. 21

CONGENITAL FACIAL HEMIATROPHY

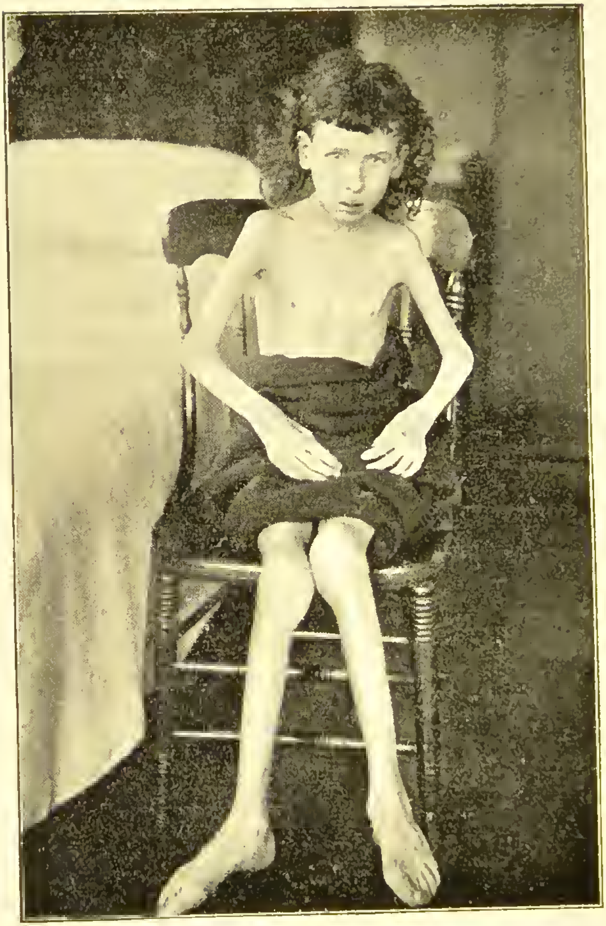


Fig. 22

TRUE OSTEO-ARTHRITIS

V. TROPHIC FUNCTIONS.

One important characteristic of the alterations in nutrition is that they occur very distinctly in cerebral paralyses in children. Marked muscular wasting, stunting of the growth of a limb, asymmetry of the head and body, and atrophy of the skin may be observed in such cases. Progressive facial hemiatrophy is almost unknown; a congenital form of hemiatrophy, especially of the lower part of the face, is sometimes observed, and is usually associated with malformation of the corresponding auricle (Fig. 21). Extreme muscular atrophy is present in infantile paralysis and in the dystrophies, and, if the loss of power remain, in peripheral birth paralyses. In the first of these, and to some extent also in the third, the skin becomes cold and shrivelled, the limb is stunted and rather cyanosed. In the second, there is nothing but pure muscular atrophy; this may be distinguished from spinal muscular atrophy by the absence of the reaction of degeneration and of fibrillary twitchings. A spurious hypertrophy of the muscles occurs in the early stage of one of the dystrophies—pseudo-hypertrophic paralysis. A true hypertrophy may be (rarely) met with in cerebral paralysis, where the contracture and spasm are sufficient to improve the nutrition of the part. Among other trophic and vaso-motor changes to be observed are *tâches cérébrales*, which are common in meningitis. but occur in other diseases, and so are of little diagnostic value. We may also see herpetic and other rashes in cerebro-spinal meningitis, uni-lateral or otherwise localised sweating in tubercular meningitis, and the alternate flushing and pallor of migraine. The electrical reactions of the muscles are exactly the same as in the adult. In young children chloroform is needed in order to carry out the examination satisfactorily. Its chief value is in deciding between a paralysis of the second trophic realm and a muscular dystrophy or a pseudo-paralysis of rachitic origin. In the latter the reactions are normal; in the former the reaction of degeneration is present.

EXAMINATION OF THE LOCOMOTORY SYSTEM.

Joints.—In acute rheumatic arthritis the swelling is slight, the tenderness and immobility are less than in the adult, and more than one joint is affected by the transient inflammation. Chronic rheumatic arthritis, in which the joints have become permanently stiff and the capsules thickened, is occasionally met with. This has to be distinguished from rheumatoid, or osteo-arthritis The characteristic features of the latter are the presence of bony outgrowths or osteophytes from the neighbourhood of the articular surfaces, and the creaking on movement, from eburnation of the ends of the bones. The condition is usually symmetrical and widely spread; it causes serious crippling (Fig. 22.) Closely allied to this is a disease which, although described along with osteo-arthritis, seems to be independent of it. In it there is symmetrical and distorting affection of the joints, associated with enlargement of the glands and spleen and with anæmia. There are, however, no osteophytic outgrowths.

When there is severe pain in the region of a joint, or (should the affected articulation be a deeply-seated one, such as the hip) apparently in the joint itself, and if with this there is high fever and constitutional disturbance, acute osteomyelitis may be diagnosed. The only condition likely to simulate it, and that chiefly in quite young children, is an acute tubercular affection of a joint. Synovitis also occurs in Schönlein's disease, in hæmophilia, and sometimes as a sequel of a gonococcal infection. The last may occur in newly-born infants suffering from ophthalmia neonatorum. An arthritis occasionally occurs in the later stages of congenital syphilis. Other signs of the disease—interstitial keratitis and Hutchinson's teeth—should be looked for.

Great laxity of all the joints, allowing of hyperextension and lateral movement, is commonly due to rickets.

Epiphyses.—The region of the epiphyses, being a seat of rapid growth, is very liable to disease in childhood. The most common alteration is the rachitic enlargement, which is characterised by its chronicity and its symmetry. The wrists, ankles, ribs, and lower ends of the thighs are the favourite sites. Bending of the shafts of the bones may be present. Epiphysitis also occurs in congenital syphilis. It is not symmetrical, though more than one limb may be affected. A swelling of the end of one of the long bones is felt, which is but slightly if at all tender, and with this there is often a more or less complete paralysis—a syphilitic pseudo-paralysis—of the extremity. The epiphyses may be invaded by a pyogenic infection—acute epiphysitis (osteomyelitis). The lesion is more frequently multiple in infants than in older children. The epiphysis may also be the seat of a tubercular deposit. In cretinism there is usually some enlargement of the epiphyses. In achondroplasia the limbs as a whole are stunted; this is due to a defective intra-uterine growth of the bones developing from cartilage. Diastasis may occur as the result of injury.

Shafts.—Among acute affections of the shafts of the bones only two call for mention—acute suppurative periostitis (osteomyelitis), and subperiosteal hæmorrhage in scorbutus. The former is marked by fever, great tenderness, and considerable swelling of the parts over the affected bone. The skin is glazed and red, but fluctuation can seldom be distinctly detected. The only condition which may simulate it is erythema nodosum; the resemblance, however, is but superficial. The scorbutic hæmorrhage is less acute; a brawny swelling of the leg or thigh is seen, and the skin over it is tense and reddened, but not hot. It is less tender than acute periostitis, and other signs of scurvy are in most cases present. It is most likely to be mistaken for an abscess or a tumour, the resemblance to the latter being heightened if, as may be the case, spontaneous fracture occur.

The chief chronic affections of bone are the simple (and in most cases traumatic), the tubercular, and the syphilitic. There is little difficulty in coming to a diagnosis of simple traumatic periostitis; the history is usually evident. Syphilitic disease of bones, besides the epiphysitis and arthritis above mentioned, generally manifests itself in the form of a chronic periostitis and osteitis, often of the tibia, and occurring as a late symptom, commonly in cases which show Hutchinson's teeth or interstitial keratitis. In younger infants a syphilitic dactylitis, closely resembling tubercular disease, may be observed. The general diagnosis of tubercular bone disease, and its differential diagnosis from other lesions, are mainly of surgical interest.

Spontaneous fracture or separation of the epiphysis may occur in syphilitic epiphysitis, sarcoma, scurvy, and fragilitas ossium. A firm swelling of the shaft of a bone may be due to callus from an unrecognised greenstick fracture. This is not uncommonly seen in the clavicle, especially in cases of severe rickets.

Clubbing of the fingers is indicative of chronic lung and cardiac affections, and in particular of congenital heart disease with much cyanosis. A general stunting of a limb or part of a limb is seen in infantile paralysis and in cerebral palsies. It is less marked in the latter, but may involve a larger area; there may be slight backwardness in the growth of one-half of the body. The chief affections of the spine and cranium have been mentioned in treating of the examination of the nervous system.

Muscles.—The muscles waste in many diseases, but perhaps the most marked atrophy is that seen after rickets. Its differential diagnosis from wasting due to a nervous lesion has already been mentioned. In all joint affections, particularly in osteo-arthritis and tubercular disease, the muscles near the articulation involved become atrophied. Rheumatic myositis is common; it is seen, for example, in one of the forms of wry-neck. In scorbutus, hæmorrhage may take place into the muscles; it is, however, less common in this situation than under the periosteum.

The locomotory system is the seat of many deformities, but most of them are of surgical rather than of medical interest.

SECTION III.

CHAPTER X.

DISEASES OF THE NEWLY-BORN CHILD.

Contents.—I. Congenital Feebleness—II. Asphyxia Neonatorum—III. Congenital Atelectasis—IV. Cephalhæmatoma—V. Hæmatoma of the Sterno-Mastoid—VI. Mastitis—VII. Icterus Neonatorum—VIII. Sclerema Neonatorum—IX. Œdema Neonatorum—X. Ophthalmia Neonatorum—XI. Acute Pyogenic Diseases—XII. Tetanus or Trismus Neonatorum—XIII. Hæmorrhagic Diathesis of Infancy—XIV. Pemphigus Neonatorum—XV. Inanition Fever—XVI. Umbilical Hernia, Tumours, &c.—XVII. Birth Paralyses—XVIII. Acute Fatty Degeneration—XIX. Epidemic Hæmoglobinuria.

I. CONGENITAL FEEBLENESS.

Feebleness in the newly-born child may be due to maternal causes, such as privation, bad hygienic surroundings, alcoholism, and illness. Irrespective of such circumstances, it occurs in premature infants, in twins, and in triplets. An infant whose weight is below 4½ pounds, and whose length is less than 19 inches is to be regarded as feeble. It is thin, the face is ill-developed and angular, the skin is wrinkled, bright red, and glossy; in addition, signs of prematurity may be present. The chief of these are:—lanugo on the back, face, and extensor surfaces generally; persistence of the pupillary membrane; unusual size of the fontanelles and sutures; thin nails not reaching the finger tips; testicles as yet undescended, or in girls, the vulva gaping and allowing the labia minora to be seen.

All the vital functions are extremely feeble, and the temperature is abnormally low. On account of the comparatively large body surface and the imperfect development of the fat, the loss of heat is great; owing to the feebleness of the circulatory and respiratory functions the production of heat is small. To compensate for this, the child lies curled up in the least possible space, thereby diminishing the heat radiation. It does not move or react to stimuli, its cry is faint, and it sleeps almost constantly. The breathing is superficial, the pulse feeble, and the digestive power and demand for nourishment slight. Such children are often unable to suck, or, if able, cannot empty the breast thoroughly, and may actually die of starvation unless artificially fed.

The organic processes are slow; the cord putrefies and is late in separating, desquamation of the cuticle is delayed, and on account of the feeble peristalsis constipation is common. Icterus is often marked. If extreme, the loss of weight is slowly replaced. From the slow healing of the navel, feeble infants are peculiarly liable to septic infection, and, on account of the deficient circulation and respiration, to bronchitis, pneumonia, and atelectasis. Inflammatory conditions are not associated with any marked rise of temperature, and cough is often absent in acute pulmonary disease. Extensive thrush is a not uncommon complication; it may involve the throat, œsophagus, larynx, trachea, and intestine.

The smaller the child is the worse is the **prognosis**; it is also rendered more grave by a continued loss of weight, and by an extremely subnormal temperature, as well as by the presence of any complication. Should the child survive the third week the outlook becomes much more promising.

Treatment.—The two great indications for treatment are the maintenance of animal heat and the administration of nourishment. The child should be kept in an atmosphere of a temperature between 80° and 90° F. Success in this respect is most easily attained by the use of a properly constructed incubator. If the child be too feeble to suck, it should be fed by allowing human milk to trickle from a spoon into its mouth or nose; should this fail, a catheter may be introduced through a nostril and food injected into either the pharynx or the stomach. The patient should be wakened regularly; crying and sneezing should be induced; and, should occasion demand, stimulants may be given by the mouth or rectum.

II. ASPHYXIA NEONATORUM.

This may be defined as a condition in which the child when born is unable to initiate or continue the act of respiration. It may arise from intra-uterine or extra-uterine causes. Under the former head come all conditions interfering with the fœtal respiration, such as protracted labour, pressure on the cord, separation of the placenta, and certain maternal diseases, of which pulmonary and cardiac ailments, febrile conditions, and hæmorrhage are the most important. The principal extra-uterine causes of asphyxia are weakness and prematurity of the infant, aspiration of fluid into the lungs, paralysis of the respiratory centre from pressure on the brain during delivery, and congenital defects of the respiratory, circulatory, and nervous systems, as, for example, white hepatisation of the lung from syphilis, bilateral pleural effusions, pressure on the trachea by tumours, and defects of the diaphragm. According to the mildness or severity of the symptoms, two varieties are described—asphyxia livida and asphyxia pallida.

In **asphyxia livida**, the less serious type, the child is cyanotic, its face is swollen, and the conjunctivæ injected. The heart acts slowly and forcibly, and the vessels of the cord are full, tense, and pulsate strongly. The muscular tone and cutaneous sensibility are retained and the child reacts to stimulation. Respiratory efforts are absent or superficial, and the natural cry is not heard.

In **asphyxia pallida** the child is pale and cadaveric looking, muscular tonicity and reflex excitability are entirely in abeyance, the sphincters are relaxed and meconium oozes from the anus. The cardiac action is weak, and the vessels of the empty cord beat feebly or not at all. The respiration may be entirely absent, or, if an occasional gasp occur, its only result is a slight retraction of the chest wall. Stimulation of the skin has no effect, and unless prompt aid be rendered the child dies.

The **diagnosis** is not difficult. The cases of the second group were formerly attributed to loss of blood. It is now known that this view is an incorrect one, so that unless direct evidence of hæmorrhage be present the possibility may be disregarded. It must, however, be remembered that an intracranial hæmorrhage may be the cause of the asphyxia ; this should be suspected if, after respiration has been established, the child relapses into the asphyctic state.

The **treatment** of these conditions is so fully dealt with in text-books of obstetrics that a mere outline of the measures indicated may suffice. After clearing mucus and other foreign matters from the mouth and pharynx, which can often be done most thoroughly by inverting the patient, the skin should be stimulated by rubbing and sprinkling with cold water, or by alternately plunging the child bodily into basins of hot and cold water. By these remedies, and by allowing the cord to bleed to the extent of half an ounce or so, the desired result is, in asphyxia livida, usually attained. In asphyxia pallida, however, more energetic treatment is required, and that generally adopted is the performance of artificial respiration after the method of Schultze. It is only necessary to remind the reader that in this, as in all other forms of artificial respiration, the first movement of the chest walls should be one whereby fluid will be expressed from the lungs; that is, an expiratory, not an inspiratory, movement. Replacing this mode of procedure, or in addition to it, inflation of the lungs by a catheter introduced into the larynx, or by the simpler "mouth to mouth" method, has been advised, and may be tried if artificial respiration fail. The faradic current gives good results at times; one pole is held stationary in the middle line of the chest, and the other applied for a moment over the sterno-mastoid, when stimulation of the phrenic nerve leads to an inspiratory movement. The thorax is then compressed and the phrenic nerve again stimulated. Faradism should never be continued too long, and is most likely to be of avail when respiration, though feeble, is not entirely suspended. The breathing should not be considered as fully established until the child is crying lustily and moving its arms and legs freely, nor until the skin is red and natural in appearance. For some little time after birth the child should be awakened at intervals in order that it may again cry and expand the lungs freely.

III. CONGENITAL ATELECTASIS.

Congenital atelectasis is very closely related to asphyxia neonatorum ; it is, in fact, the morbid condition with which that disease is generally associated. It consists in the persistence of the fœtal condition of the lungs, a state of matters generally due to defective respiratory power, the various causes of which have been discussed in the previous section.

Symptoms.—At birth the child may be suffering from asphyxia, or may only show signs of imperfect respiratory function. The breathing is shallow, irregular, and unequal, the ribs are drawn in with inspiration, the voice is faint, and the power of sucking slight or absent. The skin is cyanotic or pale, the extremities cold. The heart is normal at first, but soon becomes rapid and feeble. Such cases often end fatally, but temporary or permanent recovery may ensue. In another group of cases, the child is born asphyxiated, but under appropriate treatment is to all appearance completely restored. It is soon, however, observed that the baby is not thriving ; it remains small and delicate, and its weight does not increase so rapidly as should be the case. Such children have a feeble and whining cry, their temperature is subnormal, and their circulation deficient. They may, however, live for weeks or even months, but are very liable to attacks of cyanosis, one of which may prove fatal. The physical signs of atelectasis are not very marked ; in the majority of instances, therefore, the recognition of its existence rests chiefly on the symptoms. On percussion the note is often a little impaired and may be of tympanitic character ; the breath-sounds are feeble, but the vesicular murmur is preserved ; an occasional crepitation may be present. Bronchial breathing is very rarely heard in a case of atelectasis. The physical signs are most frequently to be heard at the base of the lung, but numerous scattered areas of lung tissue may be affected without giving rise to dulness or alteration in the breath sounds. This is due to the fact that their presence is masked by the surrounding air-containing vesicles.

A very similar train of symptoms to that previously described is occasionally the result of syphilis of the lung, or of "aspiration" bronchitis and pneumonia, where the child has sucked fluid, &c., from the maternal canals into its respiratory tract. In such conditions collapse of the previously distended lung is common.

Morbid Anatomy.—The atelectatic areas are recognised on section by their deep steel-blue or dark red colour, by their firm consistence, and by the facts that they are depressed below the surface of the air-containing lung, and when thrown into water sink. The posterior parts of the lungs are those most involved, and, as a rule, both organs are equally affected. It is often a matter of surprise to find how large a part of the pulmonary area is functionless, although the patient has lived for weeks or months with comparatively little distress.

The **treatment** is one of general stimulation, especial attention being paid to the respiratory function. Hot and cold baths, friction of the body surface, and faradisation are of value. Crying and sneezing should be promoted by tickling the nasal mucous membrane; by compressing the nose and mouth for from eight to ten seconds the child is often induced to make gasping efforts, which, when the hand is removed, distend the alveoli with air. The infant should be wakened frequently, and fed regularly and often. Plenty of pure air and warmth are essential, and stimulants should be given as occasion may demand.

IV. CEPHALHÆMATOMA.

In addition to the doughy serous swelling, known as the "caput succedaneum," so constantly met with in the newly-born child, an actual effusion of blood may take place about the cranium. The site of its occurrence is usually between the pericranium and the bone, sometimes it is between the pericranium and the aponeurosis of the occipito-frontalis muscle, and in other cases it lies between the skull and the dura mater. It is, therefore, described according to its position as **external** or **internal**; the commonest variety of all is the subpericranial. The causes leading to hæmatoma are pressure on the vessels during delivery, and possibly defective development of the cranial bones with a loosely adherent pericranium. At times it is due directly to trauma, and in other instances may be the result of the hæmorrhagic diathesis of infants. The swelling is most frequently situated on one of the parietal bones; as a rule, the right is that affected, more rarely both are involved.

In most cases it appears within the first four days as a tense fluctuating swelling covered with normal or faintly bluish skin. The size increases, gradually reaching its maximum about the tenth day; seldom, however, do its boundaries overstep those of the bone on which it originates—a fact easily explicable by the firm attachment of the pericranium to the sutures. However tense the swelling, firm pressure over its centre will, as a rule, enable us to detect the underlying surface of the skull. In a few days' time the margins become firm, while the centre remains soft; and this test is of value in assisting in the diagnosis from depressed fracture of the skull. In from two to eight weeks or more the tumour becomes absorbed, and during the process egg-shell crackling can be detected over its surface. This is due to the deposit of thin layers of new bone on the inner aspect of the pericranium.

Diagnosis.—The condition must be differentiated from the caput succedaneum and from a meningocele or encephalocele. Its size, comparative permanence, the presence of fluctuation, and the fact that it is circumscribed by the cranial sutures, serve to distinguish it from the former; while the position of a meningocele, the pulsation, and the absence of the characters described are sufficient to prevent it being mistaken for a cephalhæmatoma.

The **treatment** is expectant; if desired, gentle pressure may be employed. Internal cephalhæmatoma is one of the causes of birth paralysis, and will be discussed in a later section.

V. HÆMATOMA OF THE STERNO-MASTOID.

The force of the labour pains, the pressure of the forceps, but more frequently traction on the neck (especially in breech cases), may lead to the rupture of some fibres of one or both sterno-mastoid muscles. After easy labours it has occasionally been observed without any apparent cause. It is most liable to occur in small and premature children. Extravasation of blood, limited by the sheath of the muscle, ensues, and results in the formation of a hæmatoma. It is situated on the right more frequently than on the left side, and the upper part of the anterior division of the sterno-mastoid is that most frequently involved.

Symptoms.—During the third or fourth week of life, seldom earlier, it is remarked that the child is not holding its head straight, and further examination shows the existence of a rounded or elongated, sometimes rather knotty swelling lying along the course of the muscle. It is quite painless, firm, immobile in a vertical direction, and in rare instances may extend from the sterno-clavicular articulation almost to the mastoid process. Absorption of the swelling is gradual, and, if the laceration of the muscular fibres have been extensive, may lead to permanent contracture with resulting wry-neck. As a rule, however, the swelling disappears by the twelfth week, without leaving bad consequences.

Diagnosis.—The only condition for which it is liable to be mistaken is that of an enlarged cervical gland. The position is sufficiently characteristic to render the diagnosis easy.

The **treatment** should be directed to promoting the absorption of the effused blood and to preventing shortening of the muscle. For these ends suitable massage is the most efficacious means.

VI. MASTITIS.

As has been already mentioned, with the great functional activity of the skin at birth, some swelling of the mammary glands and secretion of colostrum occur about the second, third, or fourth day. The glands may enlarge to the size of a pigeon's egg, and should they be irritated, inflammation, which may or may not result in suppuration, is apt to ensue. Should the abscess form, as is usual, in the gland itself, destruction of the parenchyma is a not uncommon result; should the pus be extra-mammary in position it may lead to widespread cellulitis and sloughing of the connective tissue, and sometimes even to a fatal issue.

The prophylactic **treatment** consists in cleanliness, and in protecting the organs from injury by squeezing, &c. Should they become inflamed, the application of cooling lotions may prevent abscess formation, or iodide of potassium in glycerine (1 in 5), or equal parts of extract of belladonna and glycerine may be employed. The further treatment is on surgical principles, and here we may take the opportunity of mentioning that, since young children are very liable to carbolic acid poisoning, carbolised towels and dressings, whether used to subdue inflammation or to purify the skin before operations, should be applied with caution.

VII. ICTERUS NEONATORUM.

Idiopathic jaundice of the infant is one of the conditions on the borderland between health and disease. It is an almost physiological state, and affects from 80 to 90 per cent. of children.

Its **pathogenesis** has been much discussed, and at least one fact has been proved with regard to it—viz., that it is of hepatogenous, not of hæmatogenous origin. This is clearly established by the discovery of bile acids in the pericardial fluid of children dying while jaundiced.

Beyond the facts that it is seen in premature and weakly children more frequently than in others, and that it is said to occur more constantly when ligature of the cord is delayed, no other circumstance, such as sex, presentation, or the nature of the labour, appears to have any influence in its production. What then is the cause of the obstruction to the escape of bile? In the newly-born child the circulation is undergoing great and rapid changes, hence vascular disturbance may be easily induced; there is, further, congestion of the skin and mucous membranes, with desquamation of the former and catarrh of the latter; and, in addition, a rapid breaking down of the red corpuscles. These facts are admitted, but the exact mechanism of the production of jaundice is as yet disputed. It may be that we have simply desquamation and catarrh of the epithelium lining the bile ducts, with perhaps an increased production of bile. Since the fæces are never absolutely pale, it is probable that (though their colour may to some extent be due to persistence of meconium in the bowel) the obstruction to the flow of bile into the intestine is at most a partial one. It has been suggested that the hepatic circulation is liable to disturbance from the ordinary vascular changes at birth, and that, as a result, congestion and œdema of the portal spaces, with compression of the bile ducts, ensue. On the other hand (it is asserted), closure of the umbilical vein may lead to lowering of the blood pressure in the hepatic capillaries and to consequent re-absorption of bile. An ingenious hypothesis and one which (should anatomical confirmation be forthcoming) would prove eminently satisfactory, is that the closure of the ductus venosus is abnormally late, that the bile is absorbed from the intestine by the tributaries of the portal vein, and that part of this blood enters the general circulation through the patent ductus.

The **symptoms** are comparatively few in number. The jaundice is usually noticed on the second or third day; as a rule, it lasts three or four days, though in somewhat rare instances it may persist for double or thrice that period. The depth of the colour varies from the merest tinging to a dark olive yellow. The face and chest are first affected, then the sclerotics, and lastly the extremities. Slight degrees, if combined with hyperæmia, can only be detected when the skin is temporarily blanched by pressure. Otherwise the patient is quite healthy; the pulse, temperature, and respiration are unaffected, and the stools are usually of natural colour. The urine is but slightly more yellow than normal; on standing, a dirty yellowish-white sediment is deposited, in which are found, in addition to uric acid and amorphous urates, small granular masses of bile pigment, either free or surrounded by epithelium, mucus, hyaline material, &c.

Morbid Anatomy.—All internal organs, even the brain and cartilages, have an icteric tinge; a plug of mucus can in many cases be squeezed out of the bile duct.

Diagnosis.—It must be remembered that even at this epoch of life jaundice may be due to some other and more serious lesion. It may occur as a symptom in septic diseases, as a result of syphilitic hepatitis, or in consequence of congenital obliteration of the bile ducts. In the first two of these the presence of the constitutional disease is the predominant feature; the diagnostic symptoms of the last will be considered in a later chapter.

Idiopathic icterus requires no treatment.

VIII. SCLEREMA NEONATORUM.

The exact nature of this disease has been much obscured by its confusion with a different morbid condition—œdema neonatorum. With the latter we deal in the next section. Sclerema—which has nothing in common with the skin affection known as scleroderma—is but rarely met with in this country or in Germany. French and Italian observers have, however, abundant opportunity for its study, and to them most of our knowledge is due.

The exact **etiology** is unknown. It usually develops between the second and the fourth day of life; much more seldom does it appear at a later period, or as an ante-natal condition. Sex has no influence in its production; debility, whether from disease or malnutrition in the child or in the mother, seems to predispose to it. Its geographical distribution suggests a possible racial affinity. Cold appears to be an important factor in its causation; as we should expect, then, it is less frequent in summer than in winter.

Symptoms.—An extremely subnormal temperature is a constant, and probably an essential symptom. It falls progressively after birth, and such figures as 83° to 87° F. are common, while much lower readings have been recorded. The skin feels firm and indurated, and cannot be pinched up from the subjacent textures. As a rule, pitting on pressure is absent, but sometimes œdema of the cellular tissue is to be found. This has given rise to a division of the cases into the indurative and œdematous types of sclerema. The feet, legs, and thighs are most affected, but, as the disease progresses, the arms, back, and face become involved, the front of the chest being the only part constantly spared. There is, in consequence, extreme immobility of the affected parts, resulting, it may be, in actual board-like rigidity. The skin is dry, and conveys the impression of almost cadaveric chill to the hand. Its sensibility is much impaired, and its colour varies from a whitish-yellow to a dull, livid red. The other symptoms are mainly referable to the extreme weakness and to the hide bound condition of the patient; the act of sucking is often impossible; the bowels (unless gastro-enteritis exist) are confined; the pulse is feeble and frequent, the respiration slow, and the cry faint. The disease is almost invariably fatal in about a week's time. Death results from inanition or from some complication.

Morbid Anatomy.—The subcutaneous connective tissue is increased in amount, and the fat cells in its meshes are diminished in number, and show evidence of deficient oil content. The primary lesion is probably of the nature of a small-cell infiltration of the dermal and subdermal layers. The chief change in the true skin consists in blurring of the outlines of the cells of the rete Malpighii. This description holds good for the indurative variety of sclerema; in the œdematous form the connective tissue is looser and infiltrated with serum. In other organs, only secondary or accidental changes are present.

The **pathology** of the disease is unknown. It seems, however, certain that it is a primary and not merely a secondary condition; it may be of trophic origin, or (according to another view) the principal feature may be a solidification of fat in consequence of the extremely low bodily temperature.

Diagnosis.—As it is most likely to be confounded with œdema neonatorum, the chief distinguishing characteristics will be pointed out in treating of that disease.

The **treatment** consists in administering nourishment by artificial means should the child be unable to suck, and in endeavouring to maintain the bodily temperature—if possible in an incubator. Friction with oil, warm baths, and massage should be tried. Of medicinal remedies, alcohol, ether, and cardiac stimulants seem alone to hold out promise of good. The inhalation of oxygen has been recommended, and appears worthy of trial.

IX. ŒDEMA NEONATORUM.

This is probably always symptomatic of some other disease, and has in this respect much the same relations as in later life. It usually occurs within the first few days. As a rule, it begins in the lower extremities and passes upwards, the calves being early involved; in other cases the dorsa of the hands and face may alone be affected, or the hands, face, and feet may be puffy and œdematous. In extreme degrees of œdema the skin is firm and unyielding; in ordinary cases it pits easily. The surface of the affected parts is shiny and bluish or mottled. The constitutional symptoms somewhat resemble those of sclerema, but vary according to the primary lesion. If, as is frequently the case, the transudation of fluid is due to cardiac weakness, the child shows signs of great exhaustion; the temperature is low, the pulse feeble, the fontanelle sunken, the cry faint. The course of the disease depends chiefly on its severity and on the cause of the œdema. Slight cases give rise to little anxiety, while severe ones with extremely subnormal temperature are very often fatal.

Morbid Anatomy.—The changes consist in an infiltration of the subcutaneous tissue with fluid, and a great distension of the interspaces.

Pathology.—As has been stated, œdema neonatorum arises under varying conditions, of which the principal are these:—(1) **Debility** and **anæmia**, however caused. (2) **Retarded circulation** from cardiac weakness, with or without collapse of the lung. Probably most cases come within this category. Slight degrees of œdema, involving only the backs of the hands and feet, are often seen in babies who have not cried lustily at birth, and who otherwise exhibit some signs of weakness. If, in addition, the child be ingesting considerable quantities of fluid, the production of œdema will be favoured, and possibly the normal cutaneous hyperæmia may assist in its development. (3) **Nephritis.** This has been found *post mortem* in some cases, and on account of the difficulty in obtaining specimens of the urine at this age, is probably often overlooked in cases where dissection has not been performed.

Diagnosis.—There should be little difficulty in distinguishing between œdema and the indurative variety of sclerema. When, however, the œdematous sclerema is in question, it may be impossible to form a definite opinion. But even in this case induration will probably be present at some part of the body, and this, together with the absence of any primary cause of the œdema, may assist the diagnosis. It would appear, however, that at times the clinical differentiation of the two diseases may be a far from simple matter.

The **treatment** consists mainly in maintaining the bodily heat, and improving the nutrition of the patient.

X. OPHTHALMIA NEONATORUM.

Purulent ophthalmia is always due to infection, and most frequently to infection from the vaginal discharges. While the healthy secretions may produce a catarrhal conjunctivitis, the presence of gonococci or of virulent pyogenic organisms gives rise to a serious degree of inflammation.

The onset of the disease is usually about the third day; the conjunctivæ become injected, the lids swollen, and eventually there is great chemosis and a free purulent discharge. In most cases both eyes are affected, and the dangers to be anticipated, and if possible averted, are ulceration and sloughing of the cornea. Non-gonorrhœal infection is comparatively benign; gonorrhœal ophthalmia often ends in total blindness. In rare instances symptoms of general infection, such as synovitis—the so-called "gonorrhœal rheumatism" —may manifest themselves. At other times the mouth or nose of the child may be the seat of inflammation—gonorrhœal stomatitis or rhinitis.

Treatment.—The prophylaxis consists in the instillation of a few drops of nitrate of silver solution (5-10 grs. to the oz.) immediately after birth. When the disease is once established, the inflammation should be allayed by the constant application of cold, and the pus removed by the frequent and thorough irrigation of the conjunctival sac with weak perchloride of mercury solution (1 in 5,000). The lids should be painted twice daily with a solution of nitrate of silver (10 grs. to the oz.). In order to do this effectually it may be necessary to give a few whiffs of chloroform before everting the lids. Before applying the nitrate of silver, the conjunctival sac should be washed with distilled water, so that all traces of chlorides may be removed. Should the action of the silver salt appear too strong, it may be instantly checked by a few drops of weak saline solution. When one eye only is affected (unfortunately a rare occurrence) steps must be taken to protect the healthy organ from infection.

XI. ACUTE PYOGENIC DISEASES.

A clear comprehension of the varied clinical manifestations arising from the action of pyogenic organisms within the body has been much obscured by the tendency to isolate from each other the groups of symptoms which they present, and to regard these—it may be unconsciously—as differing in kind as greatly as they do in name. Puerperal fever in the infant, omphalitis and gangrene of the navel, erysipelas neonatorum, and arteritis umbilicalis are etiologically one; and by considering them and their allies from one standpoint, we are better able to understand their significance, and to appreciate the clinical phenomena which they present.

The child, even more than the adult, is exposed to the inroads of pyogenic organisms. In four-fifths of the cases the point of entry is the umbilical wound, but infection may also occur through abrasions of the skin, either from direct trauma, or from intertrigo or eczema, by excoriations of the lips, and by the conjunctivæ. Whether contaminated milk can infect the system while the gastric and intestinal mucous membranes remain intact is doubtful; more probably some breach of continuity is necessary. The possibility of intra-uterine infection through the placental circulation is asserted by some, denied by others.

It is important to remember that the most severe toxic and inflammatory symptoms may arise without the occurrence of local reaction at the point of entry of the poison.

The organisms in question have, in most instances, been the streptococcus and the staphylococcus pyogenes aureus, but other pus-producing microbes may be present. The results of the bacterial invasion are both general and local, and in any given case one or other of these may preponderate; again, the local symptoms may be more manifest at one period, the constitutional symptoms at another, and *vice versâ*. It is, therefore, clear that the symptoms which the patient presents depend on the organ or organs most involved, the degree of the general infection, and the severity of the intoxication and local processes. These circumstances are conditioned by the dose of the poison and the point at which it enters the body, but chiefly by the virulence of the organism, the resistance of the tissues, and the ratio which the two latter factors bear to one another.

Omphalitis.—A slight amount of ulceration of the umbilical wound, with the secretion of yellow, watery, or putrid pus, is not very uncommon if cleanliness be neglected. In addition to this, or arising independently, an inflammation of the navel and surrounding skin may occur. This may remain localised, or result in diffuse cellulitis; it has the usual result of such a process elsewhere, in many cases resolving, in others going on to local or diffuse suppuration, sloughing of the cellular tissue, or gangrene of the umbilicus. The last mentioned is rare; it may only involve the skin and subjacent structures, or may pass deeper and even lead to the formation of an artificial anus. The gangrene is, as a rule, moist, and the local reaction intense; but in cases of cholera infantum (where gangrene is not very uncommon) the surrounding inflammatory zone is slight.

All these conditions are most frequently seen in the second or third week, before cicatrisation of the umbilicus is complete.

Inflammation of the Umbilical Vessels.—Associated with local mischief, such as omphalitis, or arising independently, inflammation of the umbilical vessels sometimes occurs. Arteritis umbilicalis is more common than phlebitis, but the symptoms of both are obscure, and accurate diagnosis is usually impossible. The disease has occurred as an epidemic in foundling hospitals and similar institutions, and a source of infection—puerperal sepsis, contaminated instruments, sponges, &c.—is almost always traceable.

The **anatomical changes** consist in thickening of the vessel walls and infiltration of the surrounding tissues. On section the vessel is found to contain a thrombus, and pus and broken down coagula exude from the lumen. In the arteries, both of which are usually affected, the lesion extends as far as the bladder; in the case of the vein the vessel is usually involved in its whole length, and the inflammation may at times extend to the liver itself. In addition to these local changes, the usual appearances of septicæmia or pyæmia are present.

The **symptoms** are obscure, the local lesion being masked by the general blood-poisoning. Symptoms of septicæmia occurring in an epidemic form lead us to surmise the nature of the disease. By pressure on the abdominal wall towards the umbilicus pus may be expressed from the latter, and by observing the direction from which the pus comes, the diagnosis of the vessel affected may be materially assisted. In phlebitis the symptoms very closely resemble those of general peritonitis. As a rule, the streptococcus has been the exciting organism. The disease proves fatal in about a week from the onset.

Erysipelas Neonatorum.—Since most bacteriologists are now agreed upon the essential identity of the streptococcus erysipelatis and the streptococcus pyogenes, this disease falls into the group under consideration. If due to puerperal infection, it is of a severe type with intense toxæmia; whilst if due to accidental infection, it more often tends to assume the typical local appearance with which we are familiar.

The rash has the usual characteristics; it spreads in various directions; its edge is raised, well defined, and tender, and vesicles, or even bullæ, may form there. The disappearance of the rash is often followed by desquamation and œdema. The temperature rises to 102° or 104° F., or, in severe cases, higher. The pulse and respiration are proportionately hurried. The temperature falls with the fading of the rash, but too frequently the latter again spreads and involves either fresh areas of skin or those over which it has already passed. After the attack of erysipelas is over, boils and even localised gangrene of the skin are liable to occur, and the child may succumb to the exhaustion accompanying them. Apart from such grave complications as pneumonia and peritonitis, diarrhœa—often proving very intractable—is a frequent concomitant. As may be supposed, the disease is a dangerous one, especially in the early weeks of life. Recovery is said to be rare in children under a month old. In older children the prognosis is less grave, and the course of the disease the same as in the adult.

Peritonitis.—Peritonitis is usually general, less frequently localised. The symptoms to which it gives rise are the same as in later life. The breathing is thoracic, and as in infancy the diaphragm is the chief agent of respiration, this alteration in type is the more marked. The abdomen is distended and the umbilicus protuberant. Peritonitis is usually secondary to arteritis or phlebitis.

Pneumonia.—Anatomically, the condition usually found is that of pleuro-pneumonia. The physical signs are very variable and uncertain, so that in the recognition of the disease more reliance is placed on the symptoms. Of these, cyanosis, and rapid breathing with inspiratory retraction of the chest walls, are the most prominent.

Acute Osteomyelitis.—In infancy this is characterised by the multiplicity of its foci, and consequently by an acute and fatal course. The liability to separation of the epiphyses and involvement of the joints is great. Acute osteomyelitis may be mistaken for a syphilitic, gonorrhœal, or tubercular affection. The first and second of these can usually be excluded, but with the last the difficulty is greater; tubercular osteitis occurring in early infancy runs a very rapid and acute course. It is, however, rare.

Septicæmia.—The general symptoms of septic infection are manifold; the temperature varies very greatly, is characterised by extreme irregularity, and may be subnormal. Wasting of the body is a constant and prominent symptom. Icterus is not uncommon, and hæmorrhages from various organs, as well as into the skin and cellular tissue, are of frequent occurrence, and may be the immediate cause of death. Nervous symptoms may simulate those of meningitis, but gross intracranial lesions are rarely found *post mortem*. Vomiting and severe diarrhœa with foul greenish-brown or hæmorrhagic stools are fairly constant, and are due simply to catarrh of the alimentary canal. The spleen is almost invariably enlarged; endocarditis and pericarditis, though somewhat infrequent, may occur.

Treatment.—When once a pyogenic infection is established, little more than symptomatic treatment is left to us. More important is it, therefore, to guard against its occurrence by a suitable prophylaxis. This consists in ordinary cleanliness, and, in cases where there is a possibility of puerperal infection, isolation of the mother from her child and observation of the strictest rules of antisepsis. In epidemics these measures — isolation and disinfection — are specially indicated. In addition to suitable nourishment (rectal and nasal feeding being resorted to if need be) and the free use of alcohol, digitalis, and strychnine, antistreptococcic serum may be injected; and considering the gravity of the disease it may be pushed somewhat fearlessly. Locally, the treatment should be on ordinary surgical principles. For erysipelas a 10 per cent. ichthyol ointment will be found of value; to check the spread of the rash the most useful application is tincture of iodine painted on the skin about half an inch outside the spreading margin.

XII. TETANUS OR TRISMUS NEONATORUM.

It may now be regarded as certain that tetanus in the infant is due to the same organism as tetanus occurring at other periods of life. The various causes to which it was formerly attributed, such as the use of too hot baths, &c., must now be relegated to the secondary position of predisposing influences. It is well known as occurring in endemic form in certain localities; in this respect the island of St. Kilda enjoyed an unpleasant notoriety. There tetanus is called the "eight-day fever," and in 1860 it was stated that of 125 children 84 died before they were a fortnight old. In 1871, out of a population of 71 persons, there was only one young infant, and that in a dying condition.

In the majority, though not in all of the cases the organism appears to enter by the umbilical wound. The symptoms first show themselves from the third to the ninth day, rarely later. It is noticed that, on account of the spasm in the facial and masticatory muscles, the child is unable to suck. As time goes on the spasmodic contraction becomes more marked, and extends to other parts of the body. The forehead is wrinkled, the lips pout, and the jaws are clenched; later the muscles of the back are involved. The remissions of the tonic contractions become shorter as the height of the disease is reached; should recovery occur, it is gradual, never sudden. The temperature is, as a rule, moderately febrile, but varies within wide limits, and may be normal. The pulse becomes feeble and rapid, the child stuporose, and death ensues from exhaustion or interference with respiration.

The **prognosis** is always bad, and is governed by the same conditions as in the adult. The greater the delay in the appearance of the first symptoms, and the more protracted the course of the disease, the better is the chance of recovery.

Treatment.—In localities where tetanus was formerly endemic, a suitable prophylaxis in the form of antiseptic treatment of the cord, along with scrupulous general cleanliness, has almost banished the disease. Should the symptoms have developed, full doses of chloral (1 to 2 grs. every hour) will prove the most useful remedy, and should be administered by the bowel if swallowing be impossible. Potassium or sodium bromide in 5-gr. doses, Calabar bean (up to $\frac{1}{2}$ gr.), or curara ($\frac{1}{50}$ to $\frac{1}{30}$ gr.) may be tried—the last subcutaneously. For the immediate relief of these (as of all other) convulsions chloroform is of value.

Every endeavour should be made to shield the child from unnecessary stimuli: by this means the frequency of the paroxysms may be somewhat diminished. In practically all cases the amount of spasm is so great as to prevent the patient being fed in a natural manner. Rectal feeding must then be resorted to, or milk may be allowed to trickle through the nostrils into the pharynx, when it can generally be swallowed.

Though the results obtained by the use of antitoxin have not as yet proved very satisfactory, it is certainly worthy of a trial, and should, like other such remedies, be pushed freely.

XIII. HÆMORRHAGIC DIATHESIS OF INFANCY.

Loss of blood from various parts of the body is an important and not infrequent occurrence in the newly-born child. The most common sites of hæmorrhage are the gastro-intestinal canal and the umbilicus ; next come the skin, naso-pharynx, and other parts of the respiratory tract, and, in addition, blood may be effused into certain organs, such as the brain and meninges, the liver, kidneys, and other viscera. In some instances, as in meningeal hæmorrhage after delivery by forceps, or in umbilical hæmorrhage from pulling on the cord before complete separation has taken place, the immediate cause of the bleeding may be a trauma. In another group of cases hæmorrhage may be secondary to, or symptomatic of, a constitutional disease, as, for example, syphilis, the acute pyogenic diseases, acute fatty degeneration of the newly-born, icterus, &c. In addition to these cases of traumatic and secondary bleeding, we find that in a certain number of infants there is a marked tendency to the occurrence of spontaneous hæmorrhages, apart from the existence of any other constant symptom or lesion. This **spontaneous** or **idiopathic hæmorrhage** has several special and characteristic features, and forms the subject matter of what follows.

The hæmorrhage usually occurs within the first ten or twelve days of life, it tends to become multiple, and is very frequently fatal. The general symptoms are those of anæmia, with continuous oozing of blood. There is often some fever, but the temperature may remain subnormal. Icterus, diarrhœa, and convulsions or coma have been noticed. The mortality is as high as 60 per cent. of children affected. In favourable cases recovery ensues within about nine days from the onset, and there is afterwards no liability to further hæmorrhage. In the large majority of cases there is no hereditary tendency to bleeding, and the condition is quite distinct from hæmophilia, which but rarely shows itself before the end of the first year.

The exact pathogenesis of the disease is very imperfectly understood. In a considerable number, but by no means all, of the post-mortems, some inflammatory condition has been found about the umbilical vessels. The multiplicity of the effusions points to an excessive permeability or fragility of the vessel walls, or to some alteration in the blood itself. The circulatory changes at birth—the rise of blood pressure and the occasionally imperfect aspiratory action of the lungs in cases of atelectasis—may lead to rupture of the smaller vessels.

Considering the self-limited course of the disease, as well as its occasional epidemic character, it is evident that none of these conditions can be regarded as more than contributory to its occurrence. Most probably it is due to infection, not necessarily by the umbilical wound ; but as yet, though organisms have in some cases been described, the exciting cause of the disease is unknown. In one such case observed, which ended in recovery by spontaneous cessation of the hæmorrhage on the tenth day, the blood presented absolutely no abnormal features. There was neither alteration in the appearance of the red cells, increase in the number of the blood plates, nor leucocytosis. No organisms were present. The following are the chief clinical varieties of the hæmorrhagic diathesis :—

Melæna Neonatorum.—The symptoms may develop immediately after birth; generally, however, the disease begins about the second day, rarely later than the seventh. Without apparent cause blood is discharged in the stools; these may be tarry, or contain pure blood, or may consist almost wholly of coagula, but, as a rule, the earlier stools are largely fæcal, while the later ones are almost entirely sanguineous. With the melæna, or preceding it, blood is vomited; and hæmatemesis may be the prominent or, at times, the only symptom. The amount of blood passed by the bowel or mouth is sometimes so small as merely to tinge the ejecta; more frequently, however, it is very copious. Beyond those symptoms due to the loss of blood, no evidences of disease are present. The abdomen is often distended, but rarely tender. Signs of collapse speedily show themselves; the pulse becomes rapid and thready, the fontanelle sinks, and the temperature falls. As a rule, the disease ends fatally within a week's time; recovery, if it does ensue, usually occurs before the ninth day, the child, however, remaining anæmic.

The disease is not a common one, and the pathological lesions discovered have been various. Ulcers, usually of small size, have in some cases been found in the stomach, œsophagus, and duodenum; in other cases, thrombosis of the mesenteric artery has been present; but often, apart from congestion and hæmorrhagic erosion of the intestinal mucous membrane, no definite morbid change has been made out. On the other hand, gastric and intestinal ulcers of similar character have often been discovered *post-mortem* where no hæmorrhage had occurred during life.

The general **etiology** of these cases has already been alluded to. It is said that late ligature of the cord predisposes to melæna. As possible factors we must remember that congestion of the intestinal mucous membrane is normally present at birth, and that duodenal ulceration, sufficient to give rise to hæmorrhage, may result from thrombosis of the mesenteric vessels. It is only when gross lesions are excluded that we can be certain that the disease is really due to the hæmorrhagic diathesis, and not to some other, more or less accidental cause.

The **diagnosis** is easy, the only step necessary to assure it being the exclusion of sources of hæmorrhage other than the gastro-intestinal tract. Examination of the nose and pharynx should, therefore, never be omitted. Blood from the naso-pharynx of a young infant rarely escapes externally, and may in some cases have been the cause of the melæna.

The **treatment** which should be carried out is very much that adopted in analogous conditions in the adult. Ice, or an ice coil, to the abdomen, wrapping the limbs in flannel, and a diet consisting entirely of iced milk should be tried. Of internal remedies, tincture of perchloride of iron (1 to 2 minims every hour) seems the most promising; rhatany may also be tried, with, in addition, subcutaneous injections of ergotin (½ to ¾ grain). Signs of collapse indicate the free use of stimulants—alcohol, camphor, coffee, tea, &c.

Hæmorrhage from the Navel: Omphalorrhagia.—This may result soon after birth from defective pressure on the cord by the ligature, either because the latter has been badly applied, or because the cord has shrunk from loss of Wharton's jelly. At a later period a slight degree of violence, such as an effort to detach the cord, is often followed by trifling hæmorrhage. This is readily checked, and must not be confused with idiopathic hæmorrhage, which is a very serious matter indeed.

The latter begins just when the cord is separating—that is, between the fourth and ninth day. First a mere trickle, or sometimes a gush of blood is seen. As a rule, it is at first of so trivial a character as to deceive the mother or nurse. It usually progresses within a very few days to a fatal termination, but at times the course is more protracted, and in a few cases may end in recovery.

Treatment.—In this, as in other hæmorrhagic diseases, nourishment is of prime importance. Locally we apply lunar caustic, or chromic acid fused on the end of a probe. Digital pressure, if it can be efficiently applied over a lengthened period, is worthy of trial; or, as a substitute, the expedient of filling the umbilicus with plaster of Paris may be adopted. Transfixion by needles, followed by ligature *en masse*, is frequently attended by bleeding from the needle punctures.

Other Hæmorrhages.—Hæmorrhages may occur in other regions of the body, but are then of minor significance. The mouth, nose, and skin are, next to those described, the most important sources of bleeding. Epistaxis is not uncommonly associated with congenital syphilitic rhinitis. Cutaneous hæmorrhages vary very greatly in extent and appearance; they are mostly situated on the front of the chest. Hæmorrhages from the respiratory tract are not very common, but are usually fatal. Hæmaturia, and conjunctival, aural, and vaginal hæmorrhages are also to be met with. The last mentioned is rarely due to the hæmorrhagic diathesis, and in the absence of other symptoms need cause no alarm. Extravasations have been found in the meninges, thymus, lungs, liver, kidneys, spleen, and other viscera.

XIV. PEMPHIGUS NEONATORUM.

Pemphigus in young infants occurs in two varieties: simple, and syphilitic or cachectic pemphigus. This section deals with the former alone.

The bullæ—which may affect any part of the body, sparing, however, the palms and soles, and also, as a rule, the mucous membranes and conjunctivæ—vary in size from that of a pea to that of a five-shilling piece. They are filled with a clear or somewhat opalescent fluid, and the skin surrounding them is hyperæmic. When eventually they collapse or are ruptured, crusts form, which, when dry, separate and leave behind deep red circular marks on the skin. The number of bullæ varies widely in different instances;

often from thirty to forty are found. The eruption usually begins in the second week, and has a duration of about a fortnight. Unless a very extensive area is involved, complete recovery is the rule.

The **etiology** of the disease is unknown, but its occasional epidemic nature points to an organised cause. It may be related to impetigo contagiosa. No doubt the activity of the cutaneous function at birth predisposes to its occurrence.

Diagnosis.—It must be distinguished, on the one hand, from traumatic bullæ, caused by bathing with too hot water, and on the other, from pemphigus due to syphilis. This latter is characterised by the fact that, by preference, the disease involves the thin skin of the groins, axillæ, and neck, and that the palms and soles are almost invariably affected. The bullæ are small and flaccid, with purulent or sanguino-purulent contents; the patient is cachectic and inevitably succumbs.

The **prognosis** of simple pemphigus is good, unless a large area of the body be affected, when the same complications as are liable to occur in extensive burns may arise.

The **treatment** consists in ensuring absolute cleanliness by the use of warm bran baths, and the subsequent application of dusting powders.

XV. INANITION FEVER.

It has recently been observed that a close relation exists between a rise of temperature in the child during the first few days of life, and an absence or deficiency of milk in the breast of the mother. To this, which is scarcely a distinct disease, but rather the reaction of an otherwise healthy organism to an insufficient supply of fluid, the name of inanition fever has been given (*Holt*). The newly-born child becomes feeble and ceases to cry, its fontanelle sinks, and its pulse becomes small. It is noticed to be constantly attempting to suck, the skin feels hot and dry, and the temperature rises to 102° or 104° F., or even higher. No evidence of local disease can be found. With such a train of circumstances, the breasts of the mother should be examined, when it will almost invariably be found that the supply of milk is defective. As soon as the secretion becomes abundant, the child's temperature falls, and the symptoms disappear. The loss of weight is, however, usually greater than in a perfectly normal infant.

The **treatment** is simple. Give the child water to drink, to the extent of one ounce every two hours; should this fail to reduce the temperature, the baby must at once be put on a full breast or be artificially fed.

XVI. UMBILICAL HERNIA, TUMOURS, &c.

Two varieties of umbilical hernia may be observed: (1) a congenital form; (2) a form occurring after birth. The former may be due either to more or less extensive want of development of the anterior abdominal wall (exomphalos), or to persistence of the vitelline duct with protrusion of some viscus into the base of the umbilical cord. In such cases, if the child survive, operative treatment is usually required.

In the second group of cases (infantile or true umbilical hernia) the rupture results from weakness of the cicatrix left after the cord falls off; large size of the cord, and increase of abdominal pressure from coughing or straining, favour its production. The hernia may be readily reduced, and is best retained by a flat pad (such as a piece of cork or cardboard) covered with lint, and held in position by an abdominal belt. Later it is better to use strips of adhesive plaster to fix the pad, but in a very young child this is apt to irritate the skin. All causes of straining, such as bronchitis, diarrhœa, and phimosis, should if possible be removed. Small herniæ usually disappear spontaneously, and are never seen after the seventh year.

Granuloma.—After the cord falls off, a little mass of granulations sometimes appears at the umbilical wound. There is a slight serous discharge, and, as in granulation tissue elsewhere, a tendency to bleed when touched. The **treatment** is to snip away the mass, and touch the base with caustic.

Adenomata may develop from the remains of the omphalo-mesenteric duct; sarcomata also occur. Both are rare.

Patent Meckel's Diverticulum.—In some cases, the vitelline duct, instead of closing when the placental circulation is established, remains patent. It gives rise to a cherry-like projection at the umbilicus; at the apex of the swelling there is usually a small orifice through which fæcal matter passes. The condition is rare, but easy of recognition.

XVII. BIRTH PARALYSES.

The pressure to which the child is exposed during birth, whether from the maternal structures through which it passes, or from the means employed in delivery, may lead to certain forms of paralysis. To these the name of "birth paralyses" has been applied; they are of cerebral or peripheral origin; spinal paralysis from such causes is so rare that it may be disregarded.

Cerebral paralyses are in most instances due to hæmorrhage. Should the child survive for any considerable period, the symptoms will vary according to the position of the blood effusion; the consideration of such cases is deferred until the diseases of the nervous system are spoken of (see *Infantile cerebral paralysis*). Often enough, however, the lesion proves rapidly fatal; these cases may advantageously be considered in this place.

If the hæmorrhage be large the child is usually still-born; should, however, the lesion be insufficient to destroy life immediately, the child is often born asphyxiated, and, in addition, shows nervous symptoms. There may be only dulness and somnolence, or there may be tonic and clonic convulsions, slow irregular respiration, feeble pulse, and coma. It may, indeed, be broadly stated that convulsions during the first few days of life are nearly always due to cerebral hæmorrhage. Often the pupils are contracted, and, in large hæmorrhages, the fontanelles and sutures sometimes bulge. In most fatal cases the patients become comatose and die within four days; should life be prolonged, localising and secondary phenomena gradually become manifest. These will be considered in a later chapter.

Source of Hæmorrhage.—Most frequently the blood escapes from one of the cerebral veins, then from the capillaries, least frequently from the sinuses of the dura mater.

Site of Hæmorrhage.—It is practically invariably on the surface of the brain, usually subpial, less often into the pia-arachnoid, and is extra-dural (internal cephalhæmatoma) only in cases where fracture of one of the cranial bones has occurred. It is more often at the base than at the convexity, and at the posterior than at the anterior half of the brain. Not infrequently it is entirely below the tentorium.

Peripheral Paralyses.—Of these, facial paralysis, and upper-arm paralysis (*Erb*), due to injury of the upper part of the brachial plexus, are the most important. It is sufficient here to note their existence.

XVIII. ACUTE FATTY DEGENERATION—BUHL'S DISEASE.

This rare condition may be dismissed with a few words. It is probably of septic origin, and occurs most frequently in children who have suffered from asphyxia neonatorum. The chief clinical manifestations are jaundice, œdema, feeble pulse, slow breathing, hæmorrhage from various organs, and collapse. The temperature remains normal in most instances. It is invariably fatal and can only be recognised by microscopic examination of the organs. In addition to hæmorrhage into the viscera, mucous membranes, and serous surfaces, marked fatty degeneration of the heart, liver, and kidneys is present. Though umbilical hæmorrhage is common, the vessels of the cord are unaffected. It is uncertain whether the disease is of intra- or extra-uterine origin.

XIX. EPIDEMIC HÆMOGLOBINURIA—WINCKEL'S DISEASE.

This is also a very uncommon disease, only a few epidemics having been described. It begins in the earlier days of life, and has a rapidly fatal course. It is characterised by restlessness, deep and increasing cyanosis, icterus, rapid breathing, a moderate pulse-rate, and a slight rise of temperature. Vomiting and diarrhœa sometimes occur. Micturition with evident tenesmus is frequent. The urine has the characters usual in hæmoglobinuria; the blood is thick and syrupy, the red corpuscles show signs of disintegration, while the leucocytes are slightly increased. The whole course of the disease suggests a rapid hæmolysis.

and it is necessary to exclude such sources of poisoning as carbolic acid, arsenic, phosphorus, and chlorate of potash before coming to a diagnosis.

CHAPTER XI.

GENERAL CONSTITUTIONAL DISEASES.

Contents.—Infantile Atrophy—Congenital Syphilis—Rickets—Scorbutus—Rheumatism—Rheumatoid Arthritis—Chronic Rheumatic Arthritis—Sporadic Cretinism—Achondroplasia—Mongolian Idiocy—Fragilitas Ossium—Purpura.

INFANTILE ATROPHY—MARASMUS—ATHREPSIA.

Etiology.—Atrophy is brought about by anything which interferes with the assimilation of food. It is almost exclusively met with among neglected children, those of the poorer classes, and illegitimate infants. In nearly all cases the patient is bottle-fed. Nevertheless, marasmus may occur in breast-fed infants when the milk of the mother is poor, owing, for example, to privation or overwork. In these cases gastro-intestinal symptoms may be absent. The usual causes are all circumstances leading to digestive disorder—improper food, badly-cared-for bottles, insufficient nourishment, and the like. The patients usually come from among the most unhealthy surroundings. Extreme atrophy may also exist as a symptom of a wasting disease, the most common being tuberculosis.

Symptoms.—The clinical picture of atrophy is to all intents and purposes that of starvation. The patient, an infant in its first year, is emaciated almost to a skeleton. The features are pinched, the face covered with wrinkles, and a deep furrow is seen round the angle of the mouth; the outlines of all the bones stand out and seem to be covered only by the loose yellowish skin hanging in folds about the body. The cry is feeble and hoarse, the movements slow, the breathing shallow. The skin is pale or earthy, has lost its natural elasticity, and when pinched up from the underlying tissues remains in doughy folds which only gradually disappear. There may be slight desquamation. All the vital processes are affected. The alimentary system is almost constantly involved, for although atrophy may occur in children showing no signs of gastro-intestinal disturbance, it is usually a result of the mal-assimilation following chronic disorder of the digestive functions. The mouth is dry and covered with thrush; vomiting follows attempts at sucking; the stools are frequent, liquid, and offensive. As the disease progresses the asthenia becomes greater. The skull bones overlap, the anterior fontanelle sinks; the eyes remain half open even during sleep; the conjunctivæ become dry and glazed; corneal perforation may occur.

The lower jaw falls, the mouth remains open, and sucking becomes impossible by reason of the excessive weakness. The pulse is very feeble and may be slowed; the temperature falls to subnormal; the urine becomes scanty, on account of the small amount of fluid ingested and also on account of the diarrhœa. With the failing circulation the extremities become colder and are slightly cyanosed; and, with the defective respiration, areas of the lungs become collapsed. Many complications may ensue, one of the most common being pneumonia, which often results from the aspiration of fluid during the effort to swallow; erythema, erysipelas, intertrigo, pressure sores, and subcutaneous abscesses are apt to occur; the urine may contain traces of albumin, or a true nephritis may be set up. Sclerema neonatorum occurs chiefly in cases of marasmus. The patient may die from a complication or from simple inanition, at times with the supervention of symptoms of hydrencephaloid.

Diagnosis.—The diagnosis of atrophy is obvious at a momentary glance in the advanced cases; in its slighter degrees and early stages it can only be detected by noting a loss of weight instead of a regular gain. It is important, however, to remember that simple atrophy very exactly resembles that due to tuberculosis, and that in many cases the differential diagnosis can only be made by noting the effect of treatment. In some instances definite signs of tubercle may be found, and this will naturally settle the question; but tuberculosis in the young infant manifests itself rather by malnutrition than by local disturbance, and may easily escape recognition. In a certain number of cases of apparently simple atrophy glycosuria has been noticed. When the sugar is present in any quantity the case ought to be looked upon as true diabetes. Syphilis must always be excluded before a diagnosis of simple marasmus is made.

Treatment.—The indications to be fulfilled are to improve the nutrition, to support the strength, and to maintain the animal heat. The first of these is met by a suitably adjusted diet. Milk diluted according to age, cream mixture, raw meat juice, &c., must be tried until a food is found which is tolerated by the child. Rotch advises that the milk should be so modified as to contain little fat, much sugar, and a moderate allowance of proteids. As an additional means of introducing fat into the system, olive oil or cod-liver oil may be rubbed into the abdomen. The gastro-intestinal disorder is treated as described in the chapter on that subject. In cases where the circulation is failing, stimulants are needed. To maintain the animal heat, hot bottles or warm baths should be employed. Abundance of fresh air is required. Complications must be treated as they arise. In spite of the greatest care many of these patients die.

CONGENITAL SYPHILIS.

Inheritance.—The disease may be transmitted by a syphilitic father or a syphilitic mother; in certain cases both parents may be affected. When the last is the case, the probability of the offspring being diseased is great; no less than 92 per cent. of such children are infected, and the mortality rate is at least 60 per cent. When the mother alone is syphilitic, the morbidity of her children is 84 per cent., the mortality about 60 per cent. (*Fournier*). At the time when she conceives she may be already syphilitic; she may, on the contrary, not contract the disease until conception takes place, or even until a later period of pregnancy. In either case the child, instead of suffering from hereditary syphilis, may show no distinct signs of the disease, but merely be ill-nourished. The chance of escape is greater in cases of post-conceptional maternal infection. It occasionally happens that, even where the mother is syphilitic when she conceives, the child is born quite healthy. When the father alone is syphilitic there is a greater likelihood that the infant will remain free from disease—the morbidity of such children being only 37 per cent., and the mortality 28 per cent. Here again the child may show definite signs of infection, or may be merely ill-nourished, or may escape entirely. The more recent the parental affection (whichever of the parents be syphilitic) the greater is the liability of the offspring to infection, and the more severe is the infection when it does occur.

In regard to the reaction of a syphilitic child upon its mother (she herself being apparently healthy) there can be little doubt that, in spite of a few supposed exceptions to the rule, Colles's law holds good. The mother, then, is immune to the disease.

In hereditary syphilis we have to do with two sets of phenomena—the **specific lesions**, and the **disturbance to nutrition**. The effects of the nutritive disturbances are more important and more easily observed in the congenital than in the acquired form of syphilis. The following are the chief results of the depraved nutrition: (1) Intra-uterine death, resulting in abortion and the throwing off of a macerated fœtus. (2) The birth of a premature child which may or may not show signs of syphilis; in the event of their absence at the first, these are to be looked for later. (3) The fœtus is carried to full term, and shows signs of syphilis at birth or after a few weeks. (4) Except for a somewhat tardy development the children are apparently healthy; their growth is slow, they are late in learning to walk and speak, and are in general backward.

The usual result of repeated conception in a syphilitic woman is that, at first, she aborts at an early period of pregnancy; but, as time goes on, the fœtus is carried longer, until at length a full-time dead child or a premature living child, bearing the marks of the disease, is brought forth; then mature children are born which only show evidence of infection after some weeks have elapsed; finally, healthy infants, remaining free from all taint of syphilis, come into the world. It must be remembered that the above sequence of events may be most favourably influenced by treatment.

Symptoms.—Before proceeding to discuss the clinical phenomena which infantile syphilis presents, it is necessary to remind the reader that not all such cases are congenital. The disease may be acquired from accidental infection in this as in any other period of extra-uterine life. These cases are, however, rare. On the other hand, every case of congenital syphilis does not manifest itself by symptoms at or soon after birth. By the term **syphilis hereditaria tarda**, or late syphilis, is meant the condition in which, without any sign of syphilis having been present during infancy, symptoms develop later. That such cases do occur is certain, but the difficulty of deciding whether we are dealing with a true case of late syphilis, or only with a recurrence of the infantile symptoms, will always present itself. And the reason for this difficulty is that these infantile symptoms are often but slight, and unnoticed or forgotten. The syphilitic lesions found in congenital forms of the disease are secondary and tertiary. The primary sore is entirely absent, and the glandular enlargement ill-marked at best. The disease is essentially the same as the acquired form, with these two distinctions in addition to that just mentioned: the nutritive disturbance is greater; and the tertiary lesions are much less amenable to treatment than in the adult.

Skin eruptions are very constant signs of congenital syphilis. They are comparatively seldom present at birth, but more frequently appear about the fourth or sixth week of life; after the end of the second month the likelihood of their occurrence is small, and by the end of the third month may be said to be past. The rash is commonly papular or macular, has the usual brownish-red colour of the secondary syphilide, and is distributed chiefly upon the face, buttocks, hands, and feet. As it spreads, the body is more extensively covered, but at all times the parts mentioned, and the extremities generally, are more involved than the trunk. The eruption is very liable to be complicated by intertrigo, or even by deeper ulceration—brought on by neglect—but truly ulcerative syphilitic rashes are comparatively rare. Should doubt arise as to whether a lesion is actually syphilitic or merely due to superadded inflammation, the presence or absence of infiltration will often prove of assistance in solving the difficulty. It is seldom to be found in irritative lesions, and is a very common accompaniment of syphilis. Bullous eruptions are not very often met with, but are, when found, of extreme significance. They most frequently appear immediately after birth, and are seen chiefly on the palms, soles, groins, and axillæ; their contents are purulent or sanguino-purulent. Such bullæ may be regarded as pointing almost certainly to a fatal issue, and though when they appear at a later date they are of less serious import than if congenital, they are always evidence of a grave degree of infection. The liability of the palms and soles to show evidences of syphilis is further indicated by the frequency with which a very characteristic deep red, dry, glazed appearance, with slight desquamation of the epithelium, is found on these parts in all stages of the disease. When the eruption is situated on two apposed skin surfaces, as when the buttocks or axillæ are affected, it is liable to become macerated by the secretions of the part and to give rise to condylomata. When these are situated on a mucous surface the name of "mucous patches" is applied to them. These are common about the angles of the mouth, and are there especially liable to lead to ulceration—in such event giving rise to fissures known as rhagades, which as they heal leave radiating white cicatrices. Alopecia, involving the eyebrows as well as the scalp, is not unusual. Even where the skin is comparatively free from eruption, it tends to assume a brownish earthy appearance, the patient looks old and wrinkled, and has not the clear, bright complexion of a healthy child.

The **mucous membranes** are very frequently affected; indeed, one of the earliest and most constant symptoms of congenital syphilis is brought about by inflammation of the nasal mucosa. "Snuffles," as it is called, is noticed a very few days after birth in many of the cases; the child seems as if it had a cold in the head; there is, first, a discharge of watery fluid from the nostrils, later, this becomes purulent, and the nares are blocked by sanious crusts. It is a peculiarity of congenital as opposed to acquired syphilis, that, in the former, the throat is to a great extent spared. Symmetrical ulcers upon the tonsils are by no means common, but a more or less generally diffused catarrhal stomatitis is not rare. As has been said, mucous patches upon the lips are common. A slight degree of laryngitis may be present, and show itself by a hoarse whimpering cry.

The **osseous system** of the child is affected in a rather remarkable manner. At the ends of the long bones, and especially of the radius and humerus, swellings may be found; and associated therewith (although there is apparently little, if any, pain) the limb may be completely paralysed. To this the name of "syphilitic pseudo-paralysis" or "paresis" is given. The change in the bone is of the nature of an epiphysitis; there is an excessive proliferation of the cartilage cells at the junction between the epiphysis and the diaphysis, ossification is retarded, and the vascular supply becomes obstructed. As a result of this the epiphysis may become separated, and even suppuration may ensue. Pus formation and detachment of the epiphysis are, however, comparatively rare; more usually the condition does not pass beyond a slight degree of epiphysitis and is arrested by treatment. The relation of the paralysis to the bone lesion is uncertain. There is no reason to suppose that the loss of power is due to a central cause; nor does it seem to be due to immobility from pain. It almost always improves *pari passu* with diminution in the size of the swelling, but against this we must place the fact that a similar state of affairs has been observed where no osteal affection could be made out. Periostitis and joint affections may also occur in congenital syphilis. The former is most typically seen on the bones of the skull, particularly round the anterior fontanelle, where it gives rise to those parietal and frontal swellings or bosses known as "Parrot's nodes." To a thinning of the cranial bones, whereby a sensation of crackling is communicated to the examining finger, the name of "craniotabes" is applied. This condition, however, is by no means characteristic of syphilis, being often found in ordinary rickets.

These are, perhaps, the principal symptoms of congenital syphilis, but the disease affects almost every tissue of the body. In many instances, however, no clinically appreciable symptoms are produced. The chief visceral changes consist in an overgrowth of the connective tissue—an interstitial inflammation, or sometimes miliary gummata. The testicles are so constantly involved that they should be carefully examined in every case of congenital syphilis, when it will frequently be found that one or both are enlarged, harder than normal, firm and nodular. Splenic enlargement is not so common ; here, too, the change consists in a simple fibrous overgrowth—it may be to such an extent that the organ fills a considerable part of the abdominal cavity. In such cases there may be grave anæmia. Some degree of enlargement of the liver is also common. The organ is hard and firm, and by palpation its lower border can be detected a considerable distance below the costal margin. Anatomically there is an interstitial hepatitis, often with miliary gummata ; and, according to the distribution of the lesion, we may, though somewhat uncommonly, find jaundice or ascites accompanying the hepatic enlargement. The corresponding increase in the connective tissue of the kidneys, pancreas, and lungs is only of interest from an anatomical point of view, and does not give rise to symptoms during life. Ulceration of Peyer's patches, and other changes in the intestines, have been described ; they are clinically unrecognisable. In the thymus, what appears to be abscess formation is often found. As to the state of the glands some difference of opinion exists. It is tolerably certain that the indolent multiple adenitis so constantly accompanying the primary sore in acquired syphilis is no marked feature of the congenital form. At the same time, in many cases, a fairly distinct general enlargement of the superficial glands can be made out. It is right to say that many authorities look upon this as a rare and by no means characteristic symptom.

Although not altogether spared, the nervous system is in a large measure exempt from the ravages of congenital syphilis ; the signs of its involvement are often ambiguous and their significance doubtful. We shall elsewhere allude to the syphilitic form of meningitis which may simulate tubercular meningitis, but take this opportunity of pointing out its distinguishing features. The temperature is not raised, the pulse is less retarded and irregular, prodromal symptoms are usually absent, whilst the motor symptoms are prominent and early in their appearance. Recovery under antisyphilitic treatment is the most certain sign of the nature of the case. Among other results of syphilis may be mentioned paralyses of motor nerves, such as those of the eye, headaches, hemiplegia and paraplegia, sclerosis and atrophy of the brain, hydrocephalus (in some cases), and possibly simple basal meningitis. In the earlier stages of congenital syphilis some of these are very rare. This is also the case with reference to most eye affections, of which the most common—interstitial keratitis—is extremely seldom observed before the fifth year. Iritis, which may occur in quite young children, is of great rarity.

We may summarise the symptoms of early congenital syphilis by saying that at birth they are usually absent, but develop about the fourth or sixth week in most cases, and very rarely after the third month; that the most common and characteristic of them are the snuffling respiration and rhinitis, the eruption distributed over the skin of the face and extremities, the mucous patches about the mouth, the rhagades, the condylomata and excoriations about the anus, the glossy appearance of the palms and soles, the interstitial orchitis or epididymitis, and the epiphysitis and pseudo-paralysis. All these, it will be noticed, belong to the secondary series of symptoms of syphilis, and with them is usually associated great disturbance in the nutrition of the patient.

Later Symptoms.—As a rule, after the third month the skin eruptions disappear for good. The only one which is then likely to be met with is that tertiary form sometimes known as syphilitic lupus or gummatous ulcer. This may occur and prove very persistent throughout the greater part of childhood.

The true symptoms of late syphilis are not very numerous, but are, at the same time, sufficiently characteristic. One of the most important is interstitial keratitis, which is rarely (if ever) found apart from an hereditary syphilitic taint. It is very seldom met with under the age of five, and is extremely uncommon before the second year. Most cases occur between the ninth and fourteenth years. With the corneal lesion there is usually some iritis or irido-cyclitis. One of the most significant evidences of congenital syphilis is the condition known as "Hutchinson's teeth." The permanent upper central incisors are those to which attention should be directed in investigating this point; the milk teeth are never characteristically involved. The affected teeth are described as being "peg-shaped;" they are bevelled to a chisel edge in which there is a well-marked notch. When such a condition is distinctly seen it is very characteristic of congenital syphilis, but it is necessary to avoid the error of looking upon any little irregularity in the teeth (such as is so often seen in strumous and rickety children) as being an example of this defect. A third symptom of congenital syphilis is deafness. It is probably of labyrinthine origin, and is not at all amenable to treatment. These three signs are known as "Hutchinson's triad," and when they are all present the diagnosis of syphilis may be regarded as assured. In addition, the bones are often involved. Periostitis is commonly seen along with interstitial keratitis; the tibiæ are the bones most frequently affected. Nodes may also be found, and so may osteitis and sclerotic changes in the bones generally. Of other lesions of the osseous system, syphilitic dactylitis and arthritis may be mentioned; the latter is symmetrical, and the knee joints are a favourite site. The syphilitic facies is very striking; the square head with the parietal and frontal bosses, the sunken bridge of the nose from the destruction of the cartilages, the radiating scars round the angles of the mouth, with the keratitis and notched teeth, make up an easily recognisable picture.

When these late symptoms of syphilis are found in a child in whom there is satisfactory evidence of freedom from the infantile manifestations, we regard the case as one of true syphilis hereditaria tarda.

Course.—In a well-nourished child the chance of recovery is good, but relapses are apt to ensue. The disease reaches its natural termination in the first or second year. It is often succeeded by rickets.

Prognosis.—The chance of life of a syphilitic infant depends on three factors:—The state of its nutrition, the severity of the syphilitic infection, and the method of feeding adopted. Severe infection is shown by the early appearance of the symptoms, or by their existence at birth. The later the signs of the disease develop the greater is the prospect of recovery. The gravity of the bullous forms of eruptions has been already mentioned. But other things being equal, a great deal depends upon whether the mother is able to nurse her child or not. A child fed on the breast has a much greater chance of recovery than one brought up by hand, but at the same time it must be remembered that the mother is the only person whom we are justified in recommending to nurse a syphilitic infant.

The **diagnosis** of syphilis is rendered difficult only by the fact that some caution has to be exercised in eliciting the history of the father and mother. It is, therefore, important to rely as far as possible upon objective examination, and to rest as little as may be upon the information got from the parents. The history is so often misleading that we have no hesitation in disregarding it should it contradict the symptoms present. At the same time it is necessary to avoid regarding every suspicious rash upon a child's skin as syphilitic. It is not necessary to recapitulate the different signs on which reliance should be placed, and it will be sufficient to remind the reader that in the diagnosis of (say) a secondary syphilide we have to do with not merely a skin disease, but with a constitutional malady of which other signs will exist and should be sought for. The tertiary gummatous ulcers sometimes very closely resemble lupus. The chief points of distinction are that, whilst lupus involves the face by choice, gummata may attack any part of the body; the gummata are multiple, lupus seldom consists of more than one or two patches; the outline of the syphilitic ulcer is crescentic, and the characteristic apple-jelly nodules are absent; there is more infiltration of the skin in syphilis than lupus, the growth is more rapid, and the scars left behind are smooth, white, and supple, not dense and firm, as in the case of lupus. It is important to distinguish the enlargement of syphilitic epiphysitis from that of rickets. The symmetry, the beading of the ribs, the absence of pseudo-paralysis are all in favour of rickets. Should difficulty arise in a case of infantile syphilis as to whether the disease is acquired or congenital, we have to attend to the date of onset—in congenital cases the rash is rarely delayed beyond the second month ; to the history ; and to the nutrition of the patient. The congenitally syphilitic infant displays much greater signs of nutritive disturbance than does the child which has acquired syphilis after birth.

The **treatment** of syphilis consists in the administration of mercury. It is most convenient to give the drug in the form of powder by the mouth. Grey powder in doses of ¼ to ½ gr., or calomel in rather smaller amount, may be given thrice daily. To prevent diarrhœa it may be combined with a little bismuth. Instead of introducing the drug into the system by the mouth, we may employ the method of inunction. A piece of blue ointment the size of a large pea is spread upon a flannel binder and applied to the skin surface. The ointment is renewed night and morning, and care should be taken to place it over a different part of the body on each occasion. The method of inunction is only appropriate when there is no great amount of eruption, and when it is desired to obtain the action of the drug somewhat rapidly. As a local application nothing is better than a dusting powder consisting of equal parts of calomel and calamine. This should be freely applied to all moist and excoriated surfaces. In cases where there is extensive cutaneous ulceration great benefit sometimes follows the use of sublimate baths. The solution should not be stronger than 1 in 6000 or 8000. When the symptoms begin to disappear, iron tonics, such as the syrup of iodide of iron, may be given, and the malnutrition combated by the use of cod-liver oil. Very often, however, the mercury itself seems to act as a tonic and the children thrive well under its administration. With the exception of interstitial keratitis, few complications require special treatment. In cases of periostitis and other bone complications generally, and indeed in any of the manifestations of late syphilis which appertain rather to the tertiary than to the secondary period, we place most reliance on the use of iodide of potassium or sodium. This, however, should not prevent our having recourse to the mercurial plan of treatment in addition, especially in cases where there is reason to suppose that this has either been neglected previously, or carried out in an unsatisfactory manner. From what has been said in reference to the prognosis, the importance of natural feeding will be fully understood. Where the mother is unable to nurse her child, we are almost invariably driven to artificial feeding ; for, although the danger of infection of a wet nurse has possibly been exaggerated, it is, we think, never justifiable to countenance such a method of feeding the infant. Where ordinary cleanliness is observed there is otherwise scarcely any risk of healthy persons becoming infected.

RICKETS.

Pathogenesis and Morbid Anatomy.—While many points connected with the etiology of rickets are as yet very imperfectly understood, the anatomical changes, thanks chiefly to the observations of Kassowitz, are now fairly well established. The affected bones are of a deep red colour—varying in degree according to the severity of the change, they are of soft consistence, flexible, and often distorted. The epiphyses of the long bones are enlarged, and the flat bones are thickened. On section, the cut surface is hyperæmic, the cartilage thick, the marrow vascular, and the periosteum engorged and succulent. The epiphysial line is broadened, and the calcification zone irregular and wider than normal. In order to understand the minuter details of the process, it must be borne in mind that, in the development of the bone, the process of deposition of osseous tissue goes hand in hand with the destruction of that already present; further, so far at least as ossification is concerned, that the vascular supply of the bone may be divided into three more or less independent sources—the perichondral, the endosteal, and the periosteal.

Since the most important changes take place in the neighbourhood of the epiphysial line, the appearances there may be first noticed. The primary alteration consists in a distension of the somewhat scanty vessels entering the cartilage both from the perichondrium and the epiphysial line. Not only are these surcharged with blood, but new vessels develop and the vascularity of the part is in consequence increased. It will be remembered that, in normal ossification, there is a zone of proliferating cartilage cells which measures about 1 or 2 mm. in diameter, and that this is bordered by a dull yellow line of calcification about 0·5 mm. broad. The cells of the proliferating zone are arranged more or less regularly in lines parallel with the long axis of the bone. In rickets, however, owing to the hyperæmic condition of the part, these cells multiply with abnormal rapidity, and in so doing lose their regular arrangement. Instead of remaining sharply defined from the ossifying zone, and admitting of the regular spread of the marrow spaces by the gradual extension of osteoblast- and osteoclast-bearing loops of capillaries along the cell-containing channels, the proliferating zone increases by the irregular multiplication of its cells, and, as a result of this, the epiphysial line becomes greatly enlarged. This increase in the size affects the ossifying, as well as the proliferating zone, and the sharp line of demarcation between them is lost. Islands of partially-ossified tissue grow up into the proliferating zone, and tongues of cartilage remain in the zone of calcification. The outcome of this increased blood supply, with its abnormal and excessive proliferation of cartilage cells, is that, although calcification proceeds rapidly, the destruction and removal of calcified substance goes forward yet more quickly. In bad cases of rickets calcification is either incompletely performed or even remains entirely in abeyance. The lime salts are carried away by the excessive flow of plasma induced by the hyperæmia, and the growing cartilage loses its rigidity, swells, and bends.

In the endosteal vascular region similar changes occur. New vessels develop, the normally calcified tissue is destroyed and is replaced by irregularly deposited and imperfect osseous structure, and large marrow spaces. In spongy bone, in fact, a process of osteoporosis takes place.

In the region of the periosteal blood supply the same hyperæmia proceeds and similar results ensue. But here the hyperæmia extends to another set of structures—the ligaments of the adjacent joints—which become lax and enfeebled.

The morbid change, then, in rickets consists of an hyperæmia or true inflammatory process affecting the bones, in particular where rapid growth is taking place, rendering this growth more rapid and also irregular, and leading to imperfect development of osseous tissue and to a diminution of the amount of lime present in the bones.

A chemical analysis of the bones in rickets shows that the proportion of organic to inorganic material is as 65 to 35 as compared with the normal ratio of 35 to 65. The specific gravity is lower, and more water is present. As the rachitis heals, the bones become abnormally dense and sclerosed. The morbid changes in other organs are comparatively unimportant. The liver may be fatty or show an increase in its fibrous tissue. The spleen is often enlarged—sometimes greatly so; the condition is one of simple fibroid overgrowth. The heart is sometimes fatty, and a milk spot is not infrequently present from friction against the beading of one of the ribs. When the chest is much deformed the lungs are collapsed in some places (especially in their anterior parts, along the lines of the nodes on the cartilages), emphysematous in others. The muscles and skin are pale and flabby. Apart from these changes, catarrh of the bronchi and intestines is a common complication.

So far as we have gone there is little doubt as to the facts of the case. When it comes to offering an explanation of them we remain in uncertainty. It seems to be proved that the osseous change is essentially of an inflammatory nature—the hyperæmia is always present, it is proportionate in degree to the severity of the local change, and as rickets heals the vascularity decreases. It may be said at once that we have no knowledge of the irritant to which the inflammatory condition is due, but it would appear certain that, whatever be its nature, it is conveyed in the blood stream. It may be asked, why should an irritant, capable of setting up inflammation, have its action practically limited to the bones? The answer may be found in the conditions of growth of the bones; for they increase in size not throughout the whole of their structure, but by successive deposits of new material at various local areas. In these parts the development of new vessels is constantly going forward, and it is easy to see how the physiological hyperæmia may become pathological under comparatively slight provocation.

As regards the exciting cause of the rachitic change in the bones, it must be obvious that no explanation is satisfactory unless it can account for the constitutional disturbance—the malnutrition and the nervous disorder—as well as the skeletal symptoms.

The chemical theory may be mentioned only to be put aside. If an animal be entirely deprived of lime salts it is quite clear that its bones will not contain a due amount of lime ; but neither this, nor the resulting histological changes, justify the assumption that the condition produced is identical with that seen in rickets. Again, the hypothesis is unsupported by analyses of the different foods on which rachitic infants have been fed. Cow's milk, for example, contains a higher percentage of lime salts than does that of woman, and the proportion contained in most artificial foods is greatly in excess of that actually required by the tissues. Apart from the fact that the fæces of rickety children are said to contain a relatively large amount of earthy salts, there does not seem to be any evidence that the absorption of these substances from the bowel is interfered with. It does not appear probable either that lactic acid, formed by the decomposition of the intestinal contents, is always present in the alimentary canals of rickety children, or that, if it were, it would either dissolve the lime salts there, or enter the circulation and remove them from the tissues. Some French physicians ascribe great importance to dilatation of the stomach and hyperacidity of the gastric contents as a cause of rickets. As we state elsewhere, we have been unable to confirm the observation that gastrectasis is common in this disease.

It seems almost unnecessary to remark that a micro-organism of rickets has been described.

Setting all these theories aside, the two main views which at present hold the field are—(1) That rickets is due chiefly to defective diet, and in particular to insufficient animal fat, with, it may be, deficient proteids ; and (2) that the disease is due almost, if not quite, entirely to impure air. The former is the opinion of most English physicians, the latter that more generally accepted in Germany. Both are supported by much the same kind of evidence. It is held here that absence of fat in the diet is a constant factor, that the disease principally affects artificially-fed children and (though bad hygiene no doubt predisposes to its occurrence) those of the well-to-do, as well as of the poorer classes. Further, that without any other alteration in the child's environment, the administration of fat serves to cure the disease. On the other hand, Kassowitz and many other continental observers state that rickets is not much less frequent in breast- than in artificially-fed children ; that it is almost exclusively confined to those in bad hygienic surroundings ; and that, when these are improved, the disease is checked without the administration of cod-liver oil or other fats. By those who hold the second view great importance is laid on the breathing of the air of close rooms, in which many persons are herded together, where dirty clothes lie exposed to the air, and where, in general, cleanliness is not attended to. On this ground the incidence of rickets in the spring months, after the cold season with its confinement indoors, and the comparative infrequency of the disease in the autumn and early winter, are easily explicable. While, so far as our experience goes, we are inclined to ascribe to the dietetic error the predominant *rôle* in the production of rickets, we cannot overlook the rebutting evidence advanced by German physicians. It is admitted by all that bad hygiene and improper feeding predispose to rickets; the disagreement is as to which of these two factors is the more potent. The discrepancy is to some extent, no doubt, to be explained on the ground that the two sets of observers differ as to what should be considered as a *slight* degree of rickets; and the idea will also suggest itself that, after all is said and done, the true cause of the disease remains to be discovered.

Rickets is influenced in its occurrence by climate and locality. It is a disease of cold, damp, and cloudy regions, and diminishes in frequency in high northern and southern latitudes. It occurs most frequently in spring and early summer, after the children have been confined a great deal to the house during the cold of the winter, and it is much more prevalent in cities than in the country. Sex has no influence in its production, and there does not seem to be any hereditary tendency. Congenital syphilis and other chronic, as well as acute, illnesses predispose to, but do not create, rickets. The disease usually begins during the first half year of life, and is comparatively infrequent in children over the age of two. It may develop in infants a few weeks old, or even be congenital; late rickets, occurring during or after the second dentition, is decidedly rare. In its milder forms especially, it is a very common disease, affecting at least 30 per cent. of all children seen at the large out-patient cliniques of most European and American cities.

Symptoms.—We may divide the clinical phenomena of rickets into the skeletal changes and the constitutional and other symptoms.

Skeletal Changes.—The cranial bones are among the earliest affected. One of the most important and constant features of the disease is abnormal patency of the anterior fontanelle. The space may remain open long after the normal date of closure, and may be found to gape even during the third or fourth year. In young infants its size increases, the edges of the bone are eaten away, the normal shape of the fontanelle may be altered, and it sometimes becomes bordered by thickened ridges of bone. The cranial sutures remain wide, the posterior fontanelle may be felt as a distinct opening many months after birth; the lateral fontanelles may also be palpable, and the cranial bones are abnormally soft and yielding. As time goes on, new bone is deposited over the parietal and frontal eminences, and this often becomes densely ossified, forming permanent bosses. A very interesting affection of the skull is that known as **craniotabes.** In some cases of rickets careful palpation of the occipital region will show that, here and there, the bone is thin and yielding, and on pressure with the fingers a distinct crackling may be experienced. In mild cases the craniotabes is of limited extent; one or two minute areas of the occiput are affected, especially in the neighbourhood of the lambdoidal suture; in more severe cases there are distinct open spaces covered only by membrane; while in the worst cases of rickets the ossification of the whole occiput is interfered with, and the bone is represented merely by a sheet of yielding membrane.

Craniotabes is one of the early signs of rickets, being seldom seen in children over one year ; it has been supposed (erroneously) to stand in some causal relation to laryngismus. Although perhaps predisposed to by the to-and-fro rolling of the head upon the pillow, it may occur quite independently of this. As a result of the flattening of the occiput and the development of the frontal and parietal bosses, the rachitic head is often square and the vertex flat ; there are sometimes distinct sagittal and coronal grooves. Well-marked bosses are most commonly found where rickets is combined with congenital syphilis. Associated with the large square head we may notice the prominence of the veins over the cranium.

The bones of the face chiefly affected are the upper and lower jaws. The teeth appear late and in abnormal sequence—the first signs of dentition may be delayed until the sixteenth or eighteenth month. The teeth are imperfect ; the enamel is defective and decays readily. The lower jaw, in place of forming a gothic arch, becomes rectangular ; it is compressed laterally, and the teeth, instead of being placed vertically, incline inwards owing to convergence of the alveolar processes. The upper jaw undergoes the opposite changes ; it becomes somewhat pointed and beak-like, the alveolar processes diverge, and the teeth look slightly outwards instead of straight down.

The thorax shows signs of rickets later than the skull, although usually during the first half-year. The angles of the ribs become more acute than normal, but the most constant and characteristic change is the occurrence of the rachitic rosary. At the junction of the ribs with their cartilages there develops a series of beads, arranged in two symmetrical lines, which slope from above downwards and outwards, with their convexities looking inwards. Owing to atmospheric pressure during the inspiratory phase of respiration, the ribs become flattened instead of being convex ; indeed, they may actually become concave and give rise to the appearance of a lateral groove upon each side of the chest. By some, these hollows are regarded as partially due to the pressure of the child's arms against the thorax, as occurs when the body is kept tightly wrapped up. It appears, however, that they are amply explained by the yielding of the softened anterior and lateral parts of the ribs. In any case the antero-posterior diameter of the chest is increased, the transverse lessened. While these changes occur in the upper ribs, the floating ribs are often remarkably expanded and form a great contrast to the lateral narrowing of the superior parts of the thorax. A transverse groove at the level of the ensiform cartilage, and extending outwards to the axillæ, is often produced by the sinking in of the softened thorax. This groove (Harrison's sulcus) is probably due, like the deformity of the upper part of the chest, to atmospheric pressure. The floating ribs, supported as they are by the abdominal viscera, do not yield, whereas those above do—hence a hollow or groove is produced. The clavicles are also affected, they slope more backwards than is normal, and are extremely bent and angular. The scapulæ are only involved in very severe cases of rickets. Curvature of the spine is not infrequent. In infants not yet walking—*i.e.*, those in whom the lumbar curve has not yet developed—it is usually seen in the form of kyphosis ; in older children as lordosis, and in infants constantly carried on one arm, there may be scoliosis. Pelvic changes are of little importance in childhood ; when they persist until adult life their significance in parturition is well known.

The rachitic changes in the extremities are first and most easily seen in the wrists. The radio-ulnar epiphyses are swollen, and this may be noticed so early as a month or two after birth. A similar change occurs in the epiphyses of the other long bones of the limbs; but, owing partly to the fact that some—as the hip and shoulder—are thickly covered with muscle, and partly to the natural prominence of others—the malleoli of the ankles for instance—rickets is less easily recognised in these situations than at the wrist-joint. In addition to the epiphysial swelling, bending of the bone occurs. This bending most usually takes the form of an exaggeration of the natural curvature of the bones. It would appear to be dependent on at least two factors—the action of the muscles, and the effect of pressure in any direction. Thus deformities occur in the limbs of children who are not yet walking ; the femur may become bent, simply by yielding to the weight of the dependent leg when the child is sitting upon its mother's knee. Again, the early deformity of the forearm may be due to pressure as the child crawls. In children who are running about, bow-legs or knock-knee, or an outward and forward curvature of the leg bones, may develop. When curvature of the leg takes place before the child has begun to walk it usually occurs directly outwards. Distortions, however, may be found where no source of pressure can be made out, and it is believed that, in such cases, they result from muscular action. In bad cases greenstick fracture may occur. Along with the affection of the bones, the ligaments become lax and distensile ; joints in which no normal lateral movement exists can easily be bent from side to side, and, in others, hyper-extension is easy.

As results of these osseous and ligamentous changes the two principal clinical symptoms of rickets are **abnormal quietude with disinclination to move**, and the assumption of **unusual attitudes.** The first of these is seen in the early stage of the disease, when there seems to be considerable pain about the limbs. The child lies quiet and displays none of the natural restlessness of the healthy infant ; when moved it cries out and appears as if suffering. The second symptom is very noticeable in the less acute stage of the malady. The patients assume all manner of impossible positions ; they sit with their legs doubled under them, or lie with one limb extended, the other fully flexed upon the abdomen, &c. In these cases the ligamentous laxity is very marked. It is often quite easy to put the child's toe into its mouth, to fully dorsiflex the foot until it lies along the anterior surface of the tibia, to bring the foot out under the axilla, and the like.

Of the constitutional symptoms of rickets, some are due to the toxine, or whatever causes the osseous change, others to the skeletal lesion itself; and in many instances, as in the pulmonary complications, both factors come into play. The nervous phenomena are undoubtedly the most striking and constant of the general symptoms of rickets. The children are restless at night, their sleep is disturbed, and they are very liable to eclampsia. With the last we deal elsewhere. Perhaps even more characteristic of rickets is the occurrence of laryngismus stridulus and tetany. In regard to the latter it must be noted that the disease may be present in a latent form, and no history of true tetany contractures be obtainable. By latent tetany we understand cases in which facial irritability (Chvostek's symptom)—*i.e.*, a rapid contraction of the muscles of the face when the facial nerve is lightly percussed—or Trousseau's symptom, the production of contractures of a limb by pressure upon the main vessels and nerves, is present. To give the reader some idea of the relative frequency of the chief nervous symptoms of rickets we may quote the following table:—*

Out of 177 cases of rickets—

Laryngismus alone was present in	44
,, and facial irritability were present in	32
,, ,, ,, and Trousseau's symptom were present in	17
Laryngismus, tetany, facial irritability, and Trousseau's symptom were present in	9
Laryngismus, tetany, and Trousseau's symptom were present in	7
,, and Trousseau's symptom were present in	4
Facial irritability alone was present in	49
Tetany, facial irritability, and Trousseau's symptom were present in	6
Facial irritability and Trousseau's symptom were present in	7
Tetany and Trousseau's symptom were present in	2

These are the chief nervous disturbances of rickets. Spasmus nutans and nystagmus are also believed by some to result from it, but this is doubtful. They appear rather to be directly connected with dentition, and to have little direct relation to rickets. Night terrors also may occur, but are more or less accidental.

The respiratory and alimentary systems suffer greatly. Rachitic children have a marked tendency to bronchial and intestinal catarrh, and many are scarcely ever free from cough and diarrhœa. In addition to bronchitis, areas of collapse and compensatory emphysema are common, and result directly from the alteration in the form of the thorax. It can well be understood that the softened chest walls and the enfeebled musculature place the child in a bad position for resisting any serious pulmonary complaint. Pneumonia is by no means infrequent and is often fatal. Chronic gastric and intestinal catarrh is very common, and is no doubt maintained by the diet on which most rickety children are fed. It is not, however, a necessary concomitant, still less a cause of the disease: some of the patients are fairly healthy, and have both a good appetite and digestion. Dilatation of the stomach has been said to occur with great frequency in rickets, but this appears to be incorrect. Owing to the gastro-intestinal disorder the belly is often large and contrasts strikingly with the small size of the chest. The abdominal distension is doubtless due to flatulence and muscular atony, and to contraction of the size of the thorax, but in some cases the enlargement of the spleen and liver assists in producing it. The fæces are said to contain a large amount of solid residue.

---

* Stirling, *Archiv. für Kinderheilkunde*, 1896.

The skin and subcutaneous tissues show certain changes. Sweating, especially about the head at night, is a very constant symptom. The skin feels moist, and strophulus and sudamina are liable to occur. If sweating be absent, the cutaneous surface is abnormally harsh and dry. The patient may be either thin or well-nourished; the nutrition in this respect appears to depend upon whether the food (while of such a nature as to lead to rickets) has been agreeing with the digestion or not. Thus children fed on an artificial food are often plump though rachitic, whilst those brought up on some less digestible diet are both rickety and emaciated. The skin and mucous membranes are usually pale, and anæmia is a more or less frequent concomitant. The blood changes are, however, by no means constant or pathognomonic; at the same time, as we shall mention in treating of diseases of the hæmopoietic system, the condition known as "anæmia infantum pseudoleucæmica," is generally associated with rickets. Slight palpable enlargement of the spleen is a fairly common complication, but so is it in many other diseases. A considerable degree of enlargement, the organ filling a great part of the abdomen, is not frequent, and is usually associated with well-marked anæmia. The liver and glands may also be enlarged. It must be borne in mind that the increased size of both liver and spleen may be more apparent than real, and due mainly to a downward displacement of the viscera.

Many investigations of the urine have been made in cases of rickets, but with somewhat contradictory results. It would seem that no constant abnormality is present, and in particular that there is no excessive excretion of earthy salts.

Varieties of Rickets—(1) **Fœtal Rickets.**—Although rare, true fœtal rickets has been known to occur, and, consequently, the disease is occasionally congenital. Many cases of so-called fœtal rickets are not genuine examples of the disease at all. They have been regarded as cases of fœtal cretinism, and are characterised by extreme shortness of the limbs and base of the skull. There may be beading of the ribs, but on microscopical examination the typical rachitic changes are seen to be absent. The defective development of the base of the cranium (on account of which the condition was first called fœtal cretinism) is shown by a deep sinking-in of the bridge of the nose. The lesion affects all bones developed before birth from cartilage, but those developing during extra-uterine life are spared and attain their full length. In all probability the condition is distinct from cretinism, and is due to deficient development of the cartilage. It is generally known as **fœtal achondroplasia.** (2) **Acute rickets** is the name which was formerly given to scurvy rickets—*i.e.*, to the condition in which ordinary rickets is combined with infantile scorbutus. (3) **Late rickets** is decidedly uncommon, but well-authenticated cases have occurred where the disease did not begin until the age of second dentition, or even until adolescence.

Course.—It is customary to recognise four grades in the severity of the disease (*Kassowitz*). (1) Softening of the cranial bones, beading of the ribs, and swelling of the epiphyses of the forearm. (2) Atrophy of the cranial bones—craniotabes, well-marked rickety rosary, and enlargement of all the epiphyses. (3) Alterations in the form of the skull, thorax, vertebral column, and epiphyses. (4) Bending of the long bones, laxity of the ligaments, great deformity of the thorax and spine. Rickets can rarely be followed throughout its whole course. It apparently begins without prodromata, unless excessive sweating and gastro-intestinal disorder (which, however, are more correctly to be held as early symptoms) be considered as such. Except possibly at the very beginning of the illness, there is no pyrexia. The course is chronic, and partial recovery with recrudescence is common. The disease usually undergoes a natural cure by the end of the second, or the commencement of the third year. The swelling of the epiphyses of the long bones and ribs is to a great extent removed as recovery ensues, but in marked cases it remains in some degree. Parietal and frontal bosses are likely to persist. The curvature of the bones of the limbs diminishes, but, unless slight, does not altogether disappear. During the progress of the disease the patient usually emaciates and becomes anæmic; the muscular wasting and enfeeblement are very pronounced, and are often well marked at a time when all other signs of rickets have passed off.

The **prognosis** depends largely upon the circumstances of the child, and the stage of the malady. Where the surroundings are favourable, and the disease not too far advanced, the prognosis is good. Extreme muscular feebleness, a marked degree of rickets, and the presence of a complication—especially of a pulmonary complication, such as pneumonia or phthisis—render the outlook grave. The only respect in which rickets is in itself likely to prove fatal is by the repeated occurrence of glottic spasm. The prognosis as regards complete recovery is less satisfactory. Marked deformity of the chest, spine, limbs, or pelvis may seriously influence the after-life of the patient.

The **diagnosis** of rickets is almost always easy; indeed, in well marked cases an error can hardly be made. The only difficulty arising is in very slight degrees of rickets, where the epiphysial swelling is indistinct, and the dentition perhaps a little backward. If after careful examination a definite opinion cannot be formed, it will be safer to treat the case as if it were one of rickets. The rachitic enlargement of the skull must not be mistaken for hydrocephalus. In the former, the fontanelle, though large, does not bulge, craniotabes may be present, and the eye symptoms—in particular the downward displacement of the eyeballs—are absent. Rickets and hydrocephalus may, however, coexist. The rachitic enlargements of the epiphyses are easily distinguished from those of syphilis (epiphysitis) by their multiplicity as well as by the absence of local paresis and of the other signs of syphilis. The muscular wasting occurring in rickets may be so extreme as to lead to the suspicion of an infantile or other paralysis, and this the more readily in that it may persist, and be present in marked degree, in children who have to a great extent recovered from the other signs of rickets—children of the age of four or five. The loss of power and atrophy are at times sufficiently marked to merit the term of **post-rachitic pseudo-paralysis.** This is characterised by its widespread nature, its uniformity, the absence of special involvement of any one muscle or group of muscles, and by the absence of any change in the electrical reactions. The kyphosis of rickets may closely simulate Pott's disease. In children under two all the probability is in favour of the former, and the absence of any great fixation, as well as the presence of other signs of rickets, assists to make the diagnosis clear. Infantile scurvy is usually associated with rickets, and slight degrees of it may easily be overlooked. In cases of rickets where there is great tenderness of the bones, the signs of scorbutus should be sought for.

Treatment.—The treatment of rickets, if circumstances admit of its being properly carried out, is, on the whole, very satisfactory. It is, in the first instance, hygienic, and consists in the rectification of obvious defects in clothing, bathing, the ventilation of sleeping rooms, &c., but in particular of diet. When, as is most frequently the case, we find that the diet is artificial and contains fats in too small amount, these latter must be ordered. Cream is one of the most suitable means of administration. A dessert-spoonful is given with the usual bottle of milk three or four times a day. Not to dwell further on this subject, it may be said that the diet should be conducted on the principles laid down in Chapter III., with, in addition to the food there described, a little extra hydrocarbon in the form of cream. The patient should, if possible, be taken out every day. On account of the frequency with which rickety children throw the bedclothes off at night, they are peculiarly liable to take cold ; this must, therefore, be guarded against.

Of medicinal remedies two stand in the first rank—cod-liver oil and phosphorus. The former is best given in the form of a good emulsion in doses of a teaspoonful thrice daily. In cases where there is considerable diarrhœa and digestive disturbance, it may be necessary to correct this by the administration of a little calomel followed by a soda and gentian mixture ; but, most frequently, cod-liver oil is well tolerated even where the digestion is impaired. In small doses ($\frac{1}{150}$ to $\frac{1}{100}$ gr.) phosphorus is well borne by children, and may be continued over long periods. It appears of undoubted benefit, especially in severe cases of rickets, and ought to be begun early. It may be prescribed with cod-liver oil, $\frac{3}{4}$ to 1 minim of oleum phosphori being added to each dose. Otherwise it may be given in a mixture with almond oil, gum arabic, and sugar. Yolk of egg is valuable as a means of introducing both phosphorus, iron, and fat into the system. The first mentioned seems to act better in combination with organic than with inorganic substances.

Next to cod-liver oil and phosphorus may be placed iron and the calcium salts. Though beneficial in some instances, they are certainly less valuable than the remedies just mentioned. Iron is especially indicated in cases where there is much anæmia, and in them it may be combined with arsenic. Still, even when the anæmia is profound, and associated with splenic enlargement and leucocytosis, a cure has seemed at least as rapid where cod-liver oil alone was given as where iron and arsenic were used. The calcium salts may be given in the form of lime-water, as the syrup of the hypophosphite or lactophosphate of lime, or combined with iron as the well-known compound syrup of the phosphate of iron.

Deformities of the limbs should be prevented by keeping the child off the ground. At a later date surgical measures may be needed. The treatment of the pulmonary, nervous, and other complications presents no special features, and will be dealt with elsewhere.

SCORBUTUS—SCURVY RICKETS—BARLOW'S DISEASE.

Just as in the adult, so in the child, the lack of certain food elements (which we may for convenience term "antiscorbutic substances") will produce scurvy. The age at which it usually occurs is that at which bottle feeding is common—*i.e.*, before the end of the second year. It is most frequently seen between the sixth and eighteenth month; after this, as the diet becomes more varied, scurvy is not likely to develop. The disease is not most common among the lower classes, but is rather met with in comparatively well-to-do families. For, the infant which is allowed to eat at table, or to have fresh unboiled milk—whose diet, in short, is unrestricted—may, and probably will, suffer from digestive disorder, and possibly from rickets, but will always get a sufficient quantity of antiscorbutic substances to prevent the occurrence of scurvy. The only diet which will produce scorbutus is one from which fresh food is excluded. Thus, children fed entirely on any kind of patent food, condensed milk, beef-tea, bread, biscuit, oat-flour, tea, &c., will (should the diet be continued long enough) almost certainly become scorbutic. And it is important to remember that the prolonged use of sterilised milk may lead to the same result; cases have been recorded in which no other cause than the sterilisation could be discovered, and these improved when fresh milk was substituted.

It is also said that even pasteurised milk is not absolutely safe in this respect. But the danger from sterilised and pasteurised milk cannot be great. In France, where the former is extensively used, scurvy is almost unknown. In America, the opinion of physicians is against the view that the latter is liable to cause the disease. Now it will be noted that many of the substances mentioned are unsuitable as infants' food in other respects than in their defective antiscorbutic qualities. Many are of such a nature as to produce rickets, and as a matter of fact the two diseases are often associated—hence the name "scurvy rickets." This association is, however, a mere accident: in the case of scurvy rickets the addition of a little fresh vegetable juice to the diet will cure the scorbutus, but the rickets will not improve. A diet which will certainly lead to rickets does not of necessity give rise to scurvy; and the converse, though less common, may occur.

It is right to say that (although the belief in its scorbutic nature is steadily gaining ground) the disease is regarded by many Continental authorities as distinct from scurvy; as, indeed, only a modification of rachitis—an acute hæmorrhagic rickets. It is pointed out that scurvy rickets is sporadic, whereas scurvy is epidemic; that scurvy rickets affects infants of the upper classes, whilst the other is found only among the poor; that infantile scorbutus is rare in countries where the adult type is common; finally, that the symptoms of adult scurvy are in some respects different from those of the disease which we are considering. In favour of its being a variety of, or a hæmorrhagic diathesis complicating, rickets, the following are some of the arguments adduced:—Rickety alterations in the skeleton are frequently observed in scorbutus; both conditions affect the same period of life; pains in the bones are common to both disorders. It seems to us that the identity of the disease has been quite clearly established by the work of Cheadle, Barlow, and others. Answers to the above arguments will at once suggest themselves if we consider for a moment the class of patients of which we are speaking: the age of the children, the peculiar conditions as to diet, the rapid growth of the bones, and the incomplete eruption of the teeth are quite sufficient to explain the differences existing between infantile and adult scurvy. Compared with rickets scorbutus is extremely rare.

Morbid Anatomy.—Blood is found extravasated beneath the periosteum of the long bones. The femur is perhaps the one most frequently involved; the humerus, tibia, radius, ulna, and (more rarely) the fibula may be affected, as also may the ribs, scapulæ, flat bones of the cranium, &c. The lesion is most marked about the epiphyses, which, in fact, may be completely separated from the diaphyses. Fractures of the shafts of the bones may occur, and the ribs may be detached from their costal cartilages. Blood is also extravasated into the muscles, and, less frequently, into the serous membranes and viscera generally. The blood shows all the characters of anæmia. There is no leucocytosis.

Symptoms.—The principal symptoms are pallor, wasting, immobility with swelling and tenderness of the limbs, fretfulness, and (according to the state of dentition) the presence of gingivitis (*Barlow*).

The disease develops gradually or more or less abruptly. The child loses its appetite, becomes anæmic and very fretful, and cries, apparently from pain, though possibly the exact locality of the pain is undiscoverable. Soon, however, it is noticed that there is disinclination to move the legs, and that, usually about the thighs—at times also in the legs—there is a good deal of swelling. The enlargement of the limb is pyriform, often symmetrical, and is tender to the touch; the skin is tense, shining, and pale or slightly reddened in colour; there is usually no rise of temperature in the affected part. Some œdema may be noticeable. With this somewhat diffused swelling the legs are flexed, and evidently painful if moved. In more severe cases the legs are extended and in a condition of pseudo-paresis. As the swelling subsides, thickening of the bone may be made out; it is often localised to the epiphysis, but may involve the shaft. This, in its turn, subsides, though very gradually, as recovery progresses.

Whilst the affection is generally most marked in the thighs, it may involve the tibiæ only; the symmetry is not complete, but the swelling may be greater on one side than on the other, or one limb only may be involved. The arms or other parts of the body—the ribs, scapulæ, &c.—may be the seats of similar alterations. Owing to the separation of the ribs from the costal cartilages, the front of the chest may fall in, but the depression usually disappears as recovery ensues. The other changes in the locomotory system are few. There is no sign of joint effusion; the muscles are considerably wasted. Possibly the next most characteristic (though less constant) sign is sponginess of the gums. This appears to occur only where the teeth are cut or quite near the surface. The gums are swollen, at times so much so as to protrude like cherries from the mouth, and they are ulcerated and bleed at the slightest touch. Fœtor of the breath is a natural result. When dentition has not yet taken place the gums are unaffected. The anæmia is profound, and the complexion has a peculiar earthy tint. Purpuric symptoms—ecchymoses or large sugillations—may be noticed.

The above form the characteristic group of symptoms, but others have been observed in some of the cases recorded. Thus, fracture of the bones, the result of rarefying osteitis from hæmorrhage into the medulla, may occur. A not uncommon symptom is proptosis with discoloration of the upper eyelid from effused blood. This is due to extravasation into the upper and posterior part of the orbit. Conjunctival hæmorrhage may also occur. Melæna, hæmaturia, or hæmorrhage from other of the mucous surfaces is sometimes seen, and may even be the only symptom of the disease. Vomiting and gastro-intestinal disorder are common. Albuminuria has been observed. If present, enlargement of the spleen is probably due to coincident rickets or congenital syphilis. Marked sweating about the head appears to be a sign of rickets rather than of scorbutus. Suppuration may take place, and is of course due to the accidental infection of an extravasation. The nervous symptoms present, apart from the great fretfulness, are those which are so common in rickets. The glands are occasionally slightly enlarged, as in so many other conditions in infancy.

The **course** of the disease is chronic, and generally non-febrile. It is true that the temperature may be raised and assume a remittent character. This is probably due to the tension caused by the extravasations about the limbs. The duration of the disease may be as long as six months; but it commonly lasts from two to three and a half months. If the child survive the acuter symptoms there is a tendency to spontaneous recovery.

The **prognosis** depends almost entirely on the date at which the case comes under treatment. If its nature be recognised and the diet corrected, a rapid cure may be anticipated in all save the worst cases. Even if separation of the epiphyses have occurred, union usually takes place without deformity.

The **diagnosis** is not difficult. The swelling of the legs may be mistaken for osteomyelitis, sarcoma, rickets, or syphilitic epiphysitis. In the first case, the acute nature of the illness; in the second, the absence of other signs of scorbutus, ought to be sufficient to enable a diagnosis to be arrived at. In rickets the lesion is more exactly symmetrical, the arms are more involved than the legs, and tenderness is slight. No doubt there is often a scorbutic element in cases of rickets where much tenderness is present. In syphilitic epiphysitis with pseudo-paresis, though the immobility is as great, there is less pain; other signs of syphilis will usually be found. The patient may come under the care of the surgeon when suffering from fracture of the thigh, either traumatic or spontaneous, and in the latter case the condition may be looked upon as due to sarcoma. Similarly, the gums, when enormously swollen, have been regarded as being the seat of a new growth, and attempts have been made to remove them accordingly. In a doubtful case the result of treatment is a diagnostic adjunct of the greatest value.

Treatment.—The child's diet is altered to fresh milk, and as this, though sufficiently antiscorbutic to prevent the development of scurvy, is yet insufficiently so to cure the disease when it has already supervened, we add to it substances whose antiscorbutic qualities are more marked. Half an ounce of orange juice daily in divided doses, 1 oz. of grape juice, and potato gruel are among the most useful remedies. The last is prepared by rubbing a thoroughly steamed floury potato through a sieve, beating with milk to the consistence of cream, and adding a teaspoonful to every bottle. Carrot gruel may be employed in a similar manner. Raw meat juice is of great value. Under this regimen the result is very marked; in a few days the symptoms begin to subside, and rapidly disappear. So striking is the improvement, that little is needed in the way of local treatment. Moist compresses relieve the pain in the limbs. The mouth should be washed with some simple astringent and deodoriser. Rickets and anæmia require subsequent treatment.

RHEUMATISM.

Etiology.—Until within recent years rheumatism was commonly believed to be rare in children. The reason for this belief rests on the fact that, in the child, rheumatism does not run the clinical course which it does in the adult, and which has come to be regarded as typical of the disease. The chief points of difference will be discussed immediately. At present suffice it to say that, in this country, rheumatism is frequently present in the early years of life. It may occur in quite young babies, although it is not common in the first two or three years; girls are more frequently affected than boys. As in adults, the chief exciting cause of the disease is exposure to wet or cold; in addition, a strong hereditary predisposition is seen in some families. A close relationship exists between rheumatism and scarlet fever; very frequently scarlet fever is followed by arthritis, endocarditis, chorea, or some other rheumatic manifestation, and it is now pretty generally believed that these are not the direct result of the scarlatinal poison, but are symptoms of acute rheumatism to which the fever predisposes.

Symptoms.—As has already been stated, rheumatism in the child is, as a rule, quite unlike rheumatism in the adult. The swelling and extreme pain in the joints which are the characteristic phenomena of the disease in later life are but seldom seen in the young; the profuse perspiration is also nearly always absent. The onset is generally less acute, and the temperature seldom rises so high. In the child rheumatism manifests itself chiefly in the form of endo- or peri-carditis, tonsillitis, chorea, erythematous skin eruptions, subcutaneous "rheumatic" nodules, arthritis, muscular pains (the so-called "growing pains"), and pleurisy. The disease is, therefore, at the beginning, much more difficult to recognise, and, consequently, when any one of these conditions is met with, a most careful examination must be made lest others be overlooked; and the parents should be closely interrogated as to any history suggestive of the presence of such at a previous time.

Arthritis, though uncommon, is by no means unknown, and, in older children, is present in most attacks of rheumatism. When it occurs in younger patients, only one joint is, as a rule, affected; the knee, ankle, and wrist are amongst those most liable to be involved. Sometimes a joint is painful, although there is little or no swelling.

Pains in the muscles and tendons are far from rare, and in every case of so-called "growing pains" rheumatism should be suspected. Pains in the hamstrings, intercostal myalgia, and rheumatism of the muscles of the neck leading to fixation of the head, or to torticollis, are commonly met with.

Endocarditis is probably the most important, as well as one of the commonest forms in which rheumatism manifests itself in the child. In many cases it comes on insidiously with little or no cardiac pain, and it is only after considerable damage has been done that the condition is discovered—perhaps by mere accident. There is usually, however, a slight degree of fever with it. The valve most commonly affected is the mitral, and both incompetence and stenosis are frequent results; aortic disease is, however, not very uncommon. The first sign of valvular affection is usually a soft systolic murmur in the mitral area, and with this there is frequently a short early diastolic murmur—the first indication of mitral stenosis—also heard at the apex. Needless to say, many soft mitral systolic murmurs are not due to valvular disease, and disappear in a week or two; in children these functional murmurs probably bear a larger proportion to the organic than in adults. It is, of course, quite probable that an organic murmur may afterwards disappear, from the absorption of the deposit on the valve. It often happens that, with each attack of rheumatism—and relapses are common—the valves become more and more implicated. In children, endocarditis readily leads to an extreme degree of dilatation and hypertrophy.

Pericarditis, though not so common as endocarditis, occurs much more frequently than in adults. An effusion is common, and adherent pericardium frequently results. The inflammation, too, is apt to spread to the mediastinum, and to give rise to a pretty widely diffused cellulitis, resulting later, perhaps, in adhesion of the pericardium to the anterior thoracic wall.

Rheumatic nodules occur in fibrous tissues; they are most frequently found about the joints, especially at the back of the elbow, about the edges of the patella, and at the ankle joint, but they are also sometimes present down the spine, along the superior curved line of the occiput, over the clavicle, &c. They consist of fibrous tissue, and usually come out in crops. The number present may vary considerably; as a rule, they are not very numerous, but occasionally there may even be hundreds. They are slightly, if at all painful, and generally last only a week or two, though at times they may last longer. Their appearance is of bad prognostic omen on the whole, for, at the same time there is often a tendency to deposit on the heart valves. So long, then, as crops of nodules are appearing, the probability of endocarditis supervening is considerable. As they are completely absorbed in a few weeks it has been suggested that the endocarditic thickening may, in some cases, disappear in a similar manner.

Tonsillitis is frequently of rheumatic origin; so are various forms of **Erythema.** Of these, the papular and marginate forms are the commonest; the former may resemble pretty closely the eruption of measles, but it has a predilection for the extensor aspect of the limbs, and is apt to disappear and reappear, whilst the other symptoms of measles are absent. **Erythema nodosum** seems often to be of rheumatic origin, although a constant relationship has not as yet been established. **Purpura** (peliosis rheumatica) is undoubtedly often due to rheumatism.

Rheumatic pleurisy affects the left side more frequently than the right, and left-sided pleurisy may co-exist with pericarditis; whether the former is an extension from the latter, or arises independently, it would be difficult to say. Sometimes both pleuræ are affected; occasionally pneumonia appears with the pleurisy. Effusion rarely follows rheumatic pleurisy in children. Inflammation of other serous membranes, such as the peritoneum and the meninges, though met with, is extremely rare.

Chorea is very frequently an indication of rheumatism; along with endocarditis it may be the only symptom present.

The **temperature** seldom rises very high; commonly it is 101° or 102° F., but in many cases it is lower. Rheumatic hyperpyrexia is practically unknown in young children; cerebral symptoms are consequently very seldom met with. The **pulse** usually bears a direct relationship, as regards frequency, to the temperature. When the heart becomes seriously involved, however, it may get more rapid, as well as irregular and weak.

Course.—One of the most characteristic features of rheumatism in childhood is that, nearly always, only one or two symptoms appear at a time, whilst there remains a great susceptibility to return of the disease—frequently enough in a different form. Thus a child may have tonsillitis, and when this has passed away, chorea and endocarditis may appear in a few months, followed by rheumatic nodules and a greater implication of the heart; later still by swelling of the joints, and so on. The heart is very apt to become more involved with each successive return of rheumatism. The endocarditis is, as a rule, subacute—*i.e.*, there may be very little rise of temperature, and almost none of the symptoms usually present in acute affections of the heart.

The progress of the case depends very greatly on the treatment adopted, and, above all, depends on the extent of the involvement of the heart.

Diagnosis.—The early recognition of the disease is most important. Subcutaneous nodules in children are practically pathognomonic of rheumatism; endocarditis in the vast majority of cases has a rheumatic origin; so has pericarditis; and pleurisy not infrequently results from it.

Chorea in a large proportion of cases is associated with rheumatism; so are the marginate and papular forms of erythema; whilst tonsillitis, erythema nodosum, and purpura are, sometimes at least, dependent on it.

When the joints are affected they are of great diagnostic value; but, as we have seen, rheumatic arthritis is not common in children. When arthritis is present it has to be differentiated from syphilitic and other forms of epiphysitis, rickets, scurvy, pyæmia, tubercular arthritis, &c.

What has specially to be kept in mind is, in every suspicious case

—such as rise of temperature (often slight) with pains in the limbs, sore throat, chorea, or erythema—to enquire closely into the family history for rheumatism, to find out whether any of the other forms in which rheumatism shows itself have been present, and to examine most carefully for them.

Prognosis.—So far as the immediate results of an attack of rheumatism are concerned, there is little to be feared. The great danger is involvement of the heart, either by endocarditis or pericarditis, or both. If the patient is going about, as frequently occurs in obscure subacute cases, great dilatation of the heart results, and although corresponding hypertrophy usually follows for the time being, the ultimate result is much more serious than when the patient is kept at rest during the attack. The pulse is, of course, the best guide as to the working capacity of the heart; too much importance must not be given to the character of the heart murmurs, although, of course, these must be carefully watched. The appearance of recurring crops of subcutaneous nodules suggests the probability of endocarditis supervening.

Treatment.—The child should be put to bed and kept at absolute rest; he should be clad in woollen garments, and lie between blankets. At the beginning of the attack it is wise to give an aperient, such as 3 grs. of calomel, and, for a short time, he should be kept on milk diet and starchy foods: later, white meat may be added. Salicylate of soda or salicin should be given pretty freely—5 or 6 grs. every two or three hours to a child of five years. Salicin, being probably less depressing, is preferable. Under this treatment the temperature will probably fall, and the pains get less. Should there be no improvement in four or five days, another of the salicin group—*e.g.*, salol, should be tried. Alkalies—*e.g.*, bicarbonate of soda and citrate of potash, 8 or 10 grs. every three or four hours, are often very useful, especially in incipient endocarditis.

In subacute pains equal parts of salicylate of soda and Dover's powder often give great relief. After the more acute stage is past, quinine (sulphate or hydrobromate), in doses of 6 to 8 grs. per day, sometimes gives excellent results.

For the pains in the joints, wrapping the parts in wool, and the application of cloths soaked in solution of soda with a little laudanum are very soothing, whilst the limbs should be supported in a comfortable position. Where the pains are so troublesome as to prevent rest, bromides and chloral, or, if necessary, opium in small doses, should be given. In more chronic cases the application of iodine or of small blisters to the joints is indicated.

Stimulants should never be given unless absolutely required to keep the heart going. The treatment of endocarditis, pericarditis, chorea, &c., is considered in the appropriate chapters.

After the patient has recovered from the acute attack the greatest care is necessary to prevent recurrences. He should always wear woollen underclothing, and should, as far as possible, avoid cold and wet. It is probable that cold sponging, carefully carried out, inures the patient and prevents his being so readily chilled.

As anæmia is a prominent feature in some cases, the citrate of iron and quinine finds a useful place after the acute stage is past.

RHEUMATOID ARTHRITIS.

Within recent years a considerable number of cases has been recorded under the title of "Rheumatoid Arthritis" in children, but it would appear that probably more diseases than one have been included under this term. Dr. Still, to whom we are chiefly indebted for differentiating these conditions, describes two varieties :—

1. True rheumatoid arthritis resembling that in adults. In this form the disease rarely sets in before six years of age ; it comes on insidiously, and leads, as in the adult, to gradual enlargement of the joints, with stiffness and perhaps contracture. Osteophytic outgrowths from the edges of the bone are developed, with eburnation of the joint surfaces, and grating on movement. There is no enlargement of the lymphatic glands or of the spleen, and the disease follows a similar course to that seen in after-life.

2. An arthritis, commoner than true rheumatoid arthritis, nearly always beginning before the sixth year and often before the third. At first sight it resembles the previous variety, but there is neither eburnation of bone nor osteophytic outgrowth. The joints most commonly affected are the knee, wrist, and the cervical spine ; but many of the others, and especially those of the fingers and toes, are usually also involved. The affection is symmetrical ; the joints appear fusiform ; and atrophy of the muscles, and deformities consequent on the joint lesion are common. The onset of the disease is sometimes acute, with high temperature, so that the condition may closely resemble acute rheumatism, and, throughout its course, there is a tendency to periodic rises of temperature.

The pathological change consists of thickening of the capsule of the joint with some effusion into it ; pitting of the cartilage, produced apparently by vascular outgrowths from the synovial membrane, is usually also present ; but, as already stated, no eburnation and no bony outgrowths are found. Except for the occasional occurrence of pericarditis or pleurisy, this disease is not associated with any of the characteristic features of rheumatism in childhood. One of the most important features in the disease is the enlargement of the lymphatic glands. At first, those in relation with the affected joints, later, those throughout the whole body become hypertrophied and firm, but they are seldom tender. The spleen is, at the same time, enlarged, and a more or less anæmic condition is commonly present.

Etiology.—Little is known as to the cause of the disease ; poverty and bad hygienic surroundings do not seem to bear any relation to it.

Diagnosis.—The points of distinction between these two forms of arthritis have been sufficiently indicated. Both varieties must be distinguished from chronic fibrous rheumatism, where one has thickening of the capsule of the joint and of the surrounding sheaths, associated with subcutaneous nodules, endocarditis, and other signs of rheumatism. Syphilis, tubercle, and, in younger children, scurvy, rickets, and epiphysitis must all be excluded.

Prognosis.—These cases do not recover; as a rule, they advance steadily, though slowly; sometimes the progress may be arrested for a long time. Death does not occur as a direct result of the disease, but from some intercurrent malady, which is more apt to supervene because of the enfeebled and anæmic condition of the patient.

Treatment.—The child must be carefully protected from cold and wet. Residence in a warm dry climate is very valuable. Hot-air baths are useful, and movement and massage in moderation are beneficial. The anæmia should be treated; and of tonics, arsenic, iron, and cod-liver oil are probably the best.

CHRONIC RHEUMATIC ARTHRITIS.

This may follow acute or subacute rheumatism and lead to fibrous thickening in the capsule of, and around, the joint, thereby producing impaired movement, and perhaps distortion. Occasionally, it comes on quite insidiously and is then apt to resemble rheumatoid arthritis. It is to be diagnosed by the presence of other manifestations of rheumatism, such as subcutaneous nodules, endocarditis, chorea, &c., or by the history of their presence at a previous time.

The **treatment** resembles that of the similar condition in adults. The most valuable measures are hot-air baths, massage, and stimulating liniments locally; and, by the mouth, arsenic, quinine, iodide of potassium, &c.

SPORADIC CRETINISM.

Since the advent of the successful treatment of myxœdema by thyroid extract a great deal of interest has been attracted to this condition. It is closely allied to myxœdema and to endemic cretinism, and is due either to absence of the thyroid gland, or to such structural alterations in this organ as are incompatible with normal function.

Although cretinism is congenital it is seldom noticed before the eighth or ninth month or even later. For its characteristics are not very well marked in early life, and hence are liable to escape detection, in which case the patient is regarded as being simply backward. The appearances in a typical case may be described as follows:—The growth, as a whole, is stunted, that of the limbs is not proportionate to that of the head and trunk. The head is brachycephalic—*i.e.*, its transverse diameter is long compared with its antero-posterior measurement. The face is broad, flat, and heavy-looking; the eyes are widely separated, the bridge of the nose flattened, the nose itself broad, and the nostrils gaping. The lips are thick and coarse; they usually remain open and allow the teeth, which are frequently carious and imperfect, to be seen. The tongue is large—often so large as to protrude from the open mouth, and salivation is excessive. The skin has a dusky yellowish-brown tinge, and is harsh and dry; the hair is often long and straight, but scanty and brittle. The whole appearance of head and face is extremely characteristic. and when once seen can hardly fail to be again recognised. Beyond the facies, however, there are other changes. The trunk is relatively large, the skin over the abdomen loose and pendulous; umbilical hernia is common. The muscular system is flabby, the head tends to fall helplessly forward, producing a certain amount of curvature of the upper dorsal spine, which is compensated for by lordosis lower down. Above the clavicle masses of fat may be observed; they are somewhat characteristic, but are not always to be detected. In addition to these, similar collections of adipose tissue may be found in the axillæ, or in the middle line of the neck. Besides the local deposits of fat, the general subcutaneous tissue is abundant; the hands and face seem swollen and œdematous, but there is no pitting on pressure. There is either no trace of thyroid, or, in some cases, a goitrous tumour is present. Another peculiarity of the cretin is a mottled appearance of the skin; this may be noticed at an early period. As has been said, the limbs are short, there is often a degree of bow-leggedness, and the epiphyses are enlarged.

Besides these changes in the configuration of the patient, many of the vital processes are interfered with. The temperature is subnormal and cold is severely felt. The secretion of sweat is diminished, or may be entirely absent. The urine is abundant: the excretion of urea small. There is almost always constipation. Except for a low percentage of hæmoglobin, the blood is normal. The mental condition varies; in some cretins there is capacity for simple tasks, in others there is complete idiocy. In ordinary cases the patient is dull, but his attention can be attracted. His voice is gruff and his speech is generally confined to a few syllables. He does not play about, and can seldom walk properly, being usually only able to crawl. Hearing and sight do not seem impaired, and favourite dishes are appreciated. The movements are slow. Most of the patients are cleanly and good-tempered, and smile when pleased, but in some cases they are irritable and ill-natured.

Progress.—It is not until several months have elapsed after birth that anything is noticed wrong with the child; indeed, in slight cases the condition may not be recognised till somewhat later. The attention of the mother may be called to the fact that the tongue seems too large, that the child is dull and heavy, or that there is marked constipation. Even at an early date the facies may be suggestive of cretinism, and the hands are almost always characteristically stumpy and covered with redundant skin. But as yet the disproportion between the trunk and limbs does not exist. As age increases the signs of backwardness become more distinct ; the fontanelle is late in closing, and dentition is delayed. In bad cases the patient never passes beyond the stage of development of a child of one or two years of age—by the sixteenth year the eruption of the milk teeth may still be incomplete, the fontanelle unclosed, and the power of speech wanting. The generative organs retain their infantile type.

Diagnosis.—In well-marked cases the diagnosis is apparent. In early infancy it is not easy, and, as Thomson points out, achondroplasia and Mongolian idiocy may be mistaken for it. As a distinctive feature he lays stress on the shape of the hands. In cretinism the typical short broad hand with square fingers is present from birth. In Mongol idiots the wrist and metacarpus are small, the fingers thick but tapering, and the little finger short and curved towards the ring finger. In achondroplasia there is a very characteristic divergence of the index and middle fingers to the radial, and of the little and ring fingers to the ulnar, side.

Morbid Anatomy.—The only constant change is in the thyroid, which may be absent, atrophied, cystic, or fibro-cystic. Synostosis of the base of the skull is not invariable ; there may be thickening of the skull bones, and imperfect development of the diploë. The cerebro-spinal fluid may be increased in amount. There is a mucoid change in the skin similar to that occurring in myxœdema.

Treatment.—The dose of dry thyroid may be at first from $\frac{3}{4}$ gr. to $1\frac{1}{2}$ grs. every second day, according to the patient's age. The dose is increased slowly, the effects being carefully watched, until the patient is getting 5 grs. (one tabloid) every day. In place of dried thyroid, Hutchison's thyrocolloid may be employed. It is a much more active substance than the former, 10 mg. being equal to about $1\frac{1}{2}$ grs. of dried thyroid. The general results of thyroid treatment may be said to be the stimulation of metabolism. The pulse quickens, the temperature rises, the skin acts freely, and the excretion of urea is increased. The appetite improves, constipation is cured, and the body weight diminishes ; the patient rapidly becomes brighter and more active, and, if the case be progressing favourably, the fontanelle closes, the teeth appear, and a rapid gain in stature takes place. An increase of as much as $5\frac{3}{4}$ ins. in a year has been recorded. On the whole, the inconveniences attending thyroid medication are less seen in cases of sporadic cretinism than in myxœdema. Still, we notice the same points as indications for diminishing the dose. Rapid pulse, feebleness, dyspnœa, and gastro-intestinal disturbance are among the chief symptoms of thyroidism. When a considerable improvement, if not a practical cure, is attained, the amount of the thyroid given is reduced to about half a tabloid every second day. The only statement that can be made with reference to the mental condition and the prognosis generally is, that the earlier the case comes under treatment the better the result will be, and that, in favourable instances, what is almost a cure has ensued.

ACHONDROPLASIA OR CHONDRODYSTROPHIA FŒTALIS.

Both in the above paragraphs and in treating of rickets, achondroplasia has been mentioned. It consists of "an absence, arrest, or perversion" of intra-uterine endochondral ossification. The patients are born with very short limbs, in which thickening can be seen about the articulations; the head is large, and the bridge of the nose sunken on account of the defective development of the base of the skull. The hands have the peculiarity mentioned above. These children are usually premature or still-born; if they are born alive, and live to maturity, they show no signs of mental defect, but are simply intelligent dwarfs.

MONGOLIAN IDIOCY.

Langdon Down was the first to point out that, in many instances, feeble-minded children facially resembled the various ethnic groups of mankind. Thus he noticed some of negroid type, some of the Malayan variety, some like North American Indians, and a considerable number—10 per cent. of the whole—of the Mongolian type. These are characterised by a close family resemblance; the face is flat, the eyes obliquely set, sometimes with an internal epicanthal fold, the nose small, the lips large and thick, the tongue protruding and rugose. The characters of the hands have been already mentioned. Development is slow. The patients are all imbeciles of a somewhat low grade. They are amiable, excellent mimics, and have a keen sense of the ridiculous. Obstinacy is a marked feature.

FRAGILITAS OSSIUM.

This condition exists apart from any other constitutional malady. It is hereditary, and extremely rare. It consists simply of a marked fragility of all the bones, whereby fracture very readily occurs. It is distinct from osteomalacia, in which bending of the bones is observed. Curiously enough, the fractures unite well, but the prognosis as to cure of the tendency does not seem hopeful, for children have been known to sustain twelve or twenty fractures within a year or two.

PURPURA.

Clinically, four forms of purpura are recognised:—(1) **Purpura simplex**; (2) **Purpura hæmorrhagica**; (3) **Peliosis rheumatica**; (4) **Purpura fulminans.** The pathology of the disease is quite uncertain. No constant morbid change has been found, and the micro-organisms occasionally discovered have not been shown to possess pathogenic qualities. A purpuric eruption may occur

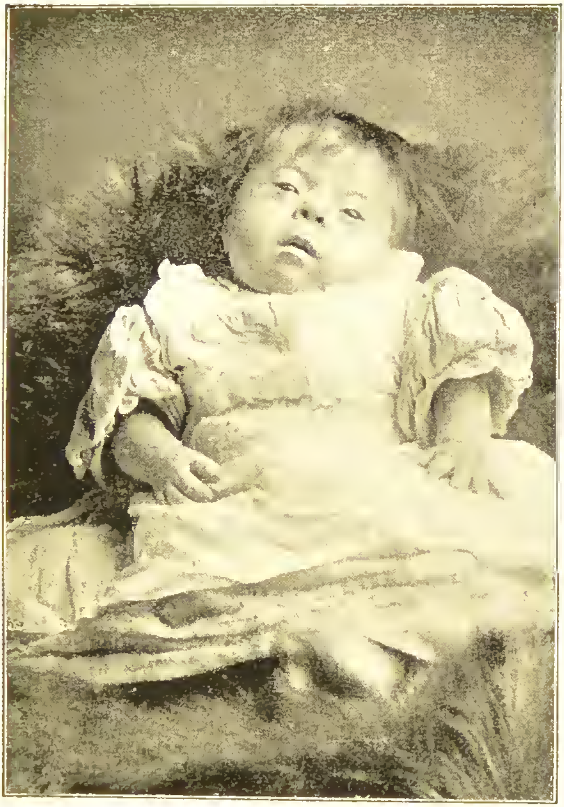


FIG. 23

MONGOLIAN IDIOT

secondarily in the course of some other disease. The conditions in which it is liable to arise are numerous; among them may be mentioned infectious diseases, such as measles, diphtheria, septicæmia, and many others; heart and kidney disease; anæmias of all kinds; chronic gastro-intestinal disorders; and skin eruptions, such as erythema nodosum and multiforme. It is, however, with primary purpura, the four varieties of which have been already mentioned, that we have here to deal. The disease affects children who are in good health as frequently as those who are ailing; the sexes are equally liable; the age at which it is most common is from the third year onwards. Infants are rarely affected by primary purpura; in them the eruption is usually secondary to some septic or other disease, or is one of the expressions of the hæmorrhagic diathesis of infancy. Although the main types of purpura are clinically distinct from each other, intermediate forms occur. This and other facts speak for the etiological similarity of the various groups.

Purpura simplex is perhaps the commonest, as it is the least serious, variety. A crop of spots appears, which has the usual characters of a hæmorrhagic eruption—a dark purple or bluish colour, and persistence on pressure. The spots vary in size, the smallest being mere petechiæ resembling those produced by the bite of a flea; from this up to the diameter of a florin, or somewhat larger, all sizes are seen. They are usually most plentifully scattered over the legs, but may involve the whole body surface. In fading they undergo the usual changes in colour seen when blood is extravasated under other circumstances. Only one crop may appear, or several may develop in more or less rapid succession; a relapse may often be brought about by making the patient move about for an hour or so. As a rule, no constitutional symptoms are present, but there may be slight feverishness and a little local irritation. The prognosis is good, but the likelihood of recurrence is considerable.

In **purpura hæmorrhagica** there are, in addition to the eruption, hæmorrhages from the mucous surfaces. Hæmatemesis, melæna, epistaxis, bleeding from the mouth, hæmaturia, and hæmoptysis are among the most common of these; bleeding from the ear and conjunctiva may also occur, and so may hæmorrhage into the retina, the nervous system, and other viscera. The cutaneous eruption usually develops suddenly, and not in successive crops. Relapses may occur, leading to profound anæmia with the development of functional cardiac murmurs. Nephritis may be set up. There is often slight fever.

Peliosis rheumatica (Schönlein's disease) is regarded by some as nothing but acute rheumatism complicated by hæmorrhages. The eruption of purpuric spots is associated, in many instances, with erythema exudativum or urticaria, and, at the same time, the joints become swollen and painful. The rash is most marked about the affected joints—usually the knees. The synovitis does not spread from one joint to another as in rheumatism. The disease is a febrile one, the temperature being remittent, and rising to 101° or 102°

F. at night. The course is somewhat chronic. In one series of cases the symptoms are such as those outlined; in another (and this of a more serious nature) gastro-intestinal symptoms are added. Vomiting and diarrhœa with colicky pain, so severe as to simulate peritonitis, may precede the onset of the purpura, and nephritis with dropsy and albuminuria may occur in the later stages. This latter form (Henoch's purpura) is more common in childhood than in adult life. Pericarditis and endocarditis are rare. It is somewhat noteworthy that little or no tendency to hæmorrhage from mucous membranes exists; there may be some little bleeding from the mouth or nose, but nothing of a more serious nature. Nevertheless the disease is often fatal, either from gradual exhaustion, gastro-intestinal disorder, or nephritis.

Purpura fulminans is apparently the rarest of all the forms of this disorder. It was first described by Henoch, and occurs exclusively in children. Those affected have been between the third month and the fifth year. The disease is always fatal in from twelve hours to a few days. The hæmorrhages are confined entirely to the skin, but are extremely severe and wide-spread. A whole limb may become discoloured by effused blood, and the lesion spreads over the body with such rapidity as to cause death. There is often delirium; convulsions and coma frequently precede the fatal issue. The exhaustion is profound. Albuminuria is not uncommon.

Little can be said as to the **diagnosis** of purpura. Our first care is to exclude all primary disease, and to make sure that we are dealing with a primary purpura, and not merely a symptomatic form. In all cases an examination of the blood, both by counting the cells and by staining films, should be made; it must be added that the results are often negative.

The general **prognosis** has been indicated above. In purpura simplex it is good; in purpura hæmorrhagica and peliosis rheumatica it must be guarded; in purpura fulminans it is bad.

The **treatment** of purpura is entirely symptomatic. Complete rest is essential, and the diet should consist largely of milk, with some fresh vegetables added, lest a scorbutic taint be present. The mineral and vegetable acids, ergot, perchloride of iron, and hydrastis may be tried, but the whole series of hæmostatic drugs may be exhausted without any benefit. Any constitutional malady requires treatment, and in peliosis rheumatica salicylates may be ordered. When possible, local measures, such as the nasal tampon in epistaxis, are indicated. Otherwise the hæmorrhage is treated on general principles.

CHAPTER XII.

DISEASES OF THE ALIMENTARY SYSTEM.

Contents.—Stomatitis—Acute and Chronic Gastro-intestinal Catarrh—Dilatation of the Stomach—Congenital Hypertrophy of the Pylorus—Intestinal Obstruction—Constipation—Idiopathic Dilatation of the Colon—Prolapse of the Rectum—Rectal Polypus—Malformations of the Intestines—Abdominal Tuberculosis—Affections of the Peritoneum—Worms—Catarrhal Jaundice—Cirrhosis of the Liver—Fatty Liver—Congenital Obliteration of the Bile Ducts—Gall-stones.

STOMATITIS.

THE mouth of the infant is extremely liable to various forms of inflammation, and the younger the child the greater is the susceptibility. Many varieties have been described; the chief of these are:—

1. CATARRHAL OR SIMPLE STOMATITIS.

Etiology.—This form is extremely common and accompanies or precedes all the other varieties. It may be due to many conditions, local or general; thus, it is found associated with the eruption of teeth, carious teeth, irritating nipples, or bad food, as well as in nearly all the infectious diseases and many other affections.

Symptoms.—There is redness and swelling of the mucous membrane of the mouth, and especially of the gums and the inside of the lips and cheeks. The tip of the tongue also suffers, as a rule, whilst the rest of its surface is furred. The condition may be comparatively limited or may be widely spread over the whole buccal cavity. With the catarrhal condition there is often some distension of the follicles, and there may be desquamation of the epithelium leading to small, painful abrasions. Salivation is usually profuse, the reaction of the saliva being neutral or acid. The child is pained when he takes the nipple, and often lets it drop with a cry. There are seldom any marked constitutional symptoms, but dyspepsia with a slight rise of temperature, and perhaps diarrhœa, may be present, the latter being probably due to the same cause as the stomatitis.

The **diagnosis** is easy. The fine abrasions must not be mistaken for thrush, nor for aphthous or ulcerative stomatitis.

The **prognosis** is entirely favourable: the duration depends on the care taken; when properly treated the condition soon disappears.

Treatment.—Removal of the cause, when possible, is generally the only treatment required, and, as a rule, recovery is complete in a few days. It is advisable, as a rule, to give the food cold; if there are gastric or intestinal symptoms these must be treated, and washing the mouth with a weak alkaline solution—*e.g.*, borax—a teaspoonful to the tumblerful of water—is soothing. When the little abrasions are very painful they may be touched with nitrate of silver.

2. Aphthous Stomatitis—Herpetic Stomatitis.

Etiology.—This condition is generally seen during the period of first dentition—from the sixth to the thirtieth month. It may be associated with local derangement in the mouth, or with acute febrile diseases. Several children in one family are frequently attacked by this disease, but the exact cause is not yet thoroughly determined.

Symptoms.—The constitutional symptoms are much more severe than in catarrhal stomatitis. Fever, rise in pulse-rate, headache, anorexia, vomiting, and diarrhœa are, one or all, not uncommon accompaniments, and the feverish condition may precede the stomatitis. The mouth is much inflamed and tender, and the lips, gums, and tongue swollen. On the edges and tip of the tongue there are rounded patches, yellowish-white in colour, with a distinctly red border ; these are depressed as a rule, but may be on the general level, or even raised above the surface. They are caused by a sub-epithelial exudation, the epithelium is shed and an ulcer is formed. The ulcers are usually also found on the inner aspect of the lips and cheek, and on the gums ; occasionally, they are also present on the palate, and even in the pharynx. They are frequently associated with herpes of the lip or, rarely, with herpes elsewhere The mouth is held open, salivation is excessive, the lips are swollen and pout, the sub-maxillary glands are usually enlarged and tender. After a few days the condition begins to abate and will usually have disappeared in from four to ten days.

[A variety of stomatitis closely resembling the above, and also described under the term "Aphthous stomatitis," is evidently foot-and-mouth disease in the human subject. In these cases, in addition to the symptoms already described, there may be small vesicles on other parts of the body, so that the condition may closely resemble chicken-pox. Indeed, it has been suggested to restrict the term aphthous stomatitis to this variety, which is practically unknown in this country, and to name the common variety "Herpetic stomatitis."]

The **diagnosis** is not difficult. The patches cannot be removed, and diphtheria of the mouth—the only thing likely to be mistaken for it—is extremely rare, usually has larger patches, and is almost always a mere accompaniment of diphtheria of the fauces.

The **prognosis** is always good, provided ordinary care be taken. If the child be neglected, however, true ulcerative stomatitis or even noma may supervene.

Treatment.—It is usually advisable to give a purgative to begin with. Rinsing the mouth with a weak solution of borax, chlorate of potash or soda, or permanganate of potash (grs. 3 to ℥i) is valuable, and chlorate of potash given internally produces wonderful results.

3. Ulcerative Stomatitis.

Etiology.—Ulcerative stomatitis occurs usually in poor, badly-fed children, and especially where there are bad hygienic surroundings and overcrowding. Under such conditions the disease may spread from one child to another. Caries of the teeth is an important predisposing factor. It is apt to follow acute diseases—*e.g.*, measles, scarlet fever, whooping-cough, &c., and a form of this affection is met with in infantile scurvy. It frequently occurs in poisoning by certain metallic poisons—*e.g.*, mercury, arsenic, phosphorus. The condition only appears when teeth are present, and it does not extend beyond the buccal cavity. Probably the immediate cause is some form of organism which, under healthy conditions, is unable to penetrate the mucous membrane.

Symptoms.—The condition begins with swelling at the free edge of the gum, and especially in front, at the roots of the incisor teeth. The gum becomes inflamed and tender, as well as swollen, and bleeds readily. Then yellowish spots are seen on the free margin, where they enlarge and lead to ulcers of various sizes. The gums become separated from the teeth, and, on pressure, some pus wells up between; there is great salivation, and a considerable amount of pain and restlessness. *Fœtor ex ore* is usually a prominent symptom, and often the one which first attracts attention to the condition. The tongue is usually furred, large, and flabby; there is irritability, want of appetite, and constitutional disturbance, more or less severe, depending on the extent of the ulceration. The lymphatic glands under the jaw are enlarged and tender. If the condition goes on, the ulceration may extend over large areas, the teeth may loosen and fall out, and the bone beneath become necrosed in places.

The **diagnosis** is quite easy. It is necessary at the same time, however, to try to determine the cause of the condition.

Prognosis.—When the cause of the disease—*e.g.*, the administration of mercury, scorbutus, &c.—has been attended to, there is practically no danger from the condition itself. The ulcers usually take eight to twelve days to heal, but may require much longer; at times, cancrum oris may become engrafted on this disease.

Treatment.—The cause must first be attended to. Carious teeth should be removed; mercury, arsenic, or phosphorus, if being given, must be stopped; infantile scurvy must be treated by appropriate dietary. Cleanliness is absolutely necessary; therefore frequent washing of the mouth with lotions of permanganate of potash, bicarbonate of soda, chlorate of potash or soda, or alum, is very beneficial. Internally, chlorate of potash in frequently repeated doses—2 grs. every hour or two for the first few days—should be administered; after this, improvement usually sets in. In more chronic cases the ulcers require to be touched with nitrate of silver.

The child must receive a liberal and easily digested diet; in great exhaustion stimulants, in more chronic cases general tonics, will be found necessary.

4. MYCOTIC STOMATITIS—THRUSH.

Etiology.—Thrush is an exceedingly common condition. It is especially apt to occur in foundling-hospitals, day-nurseries, &c., where numbers of children, frequently in a low state of health, are collected, or where there is a want of care in cleaning nipples; or if the milk is not so fresh as it ought to be. Any injury to the mucous membrane of the mouth predisposes to thrush, and the younger the child the more readily does it form. It may appear in the mouths of children, however, who are apparently quite healthy. It was formerly said that an acid reaction of the saliva was necessary for its appearance. This is not the case; it sometimes appears where the reaction is neutral or alkaline, and the acid reaction may be the result, not the cause, of its growth.

Pathology.—The disease is due to a fungus, which is seen in the form of threads or mycelia made up of short rods or of spores. It was formerly termed *Oidium albicans*, and, more recently, *Saccharomyces albicans;* but its exact nature is still under dispute. It begins to grow between the epithelial cells, and gradually extends laterally, as well as coming to the surface.

Symptoms.—Small greyish or yellowish-white patches appear on the tongue, inside of the lips, or palate. They are usually preceded by a certain amount of catarrhal stomatitis, and the little patches are surrounded by an area of deeper congestion. The spots are at first small, and somewhat raised; they increase in size and number, so that the whole of the buccal cavity is dotted with patches. Some little force is required to remove them, and an inflamed base is left, which may bleed slightly. In very young and feeble infants thrush is almost certain to appear, and may be the immediate cause of death; and in these children the condition is apt to spread to other membranes—*e.g.*, rectum, respiratory passages, &c. In fairly healthy children there may be no symptoms indicative of the presence of the disease; in other cases there may be a considerable amount of pain on trying to suck, but no salivation. The tongue is usually furred, and there are often symptoms of gastro-intestinal derangement.

The **diagnosis** is easy. The character of the patches and the slight difficulty in removing them are sufficient to differentiate the condition. If there is any doubt at all, the typical mycelia and spores will be revealed by the microscope on adding caustic potash to some of the exudation.

Prognosis.—In itself thrush is not of much consequence, and in a fairly healthy child disappears rapidly when ordinary care is taken. In very feeble children, however, it may interfere with the taking of nourishment, and may be the immediate cause of death. In such young and feeble infants the appearance of wide-spread thrush in the mouth is of some prognostic importance as showing a lessened power of resistance of the tissues.

Treatment.—Prophylaxis is of great importance. All forms of stomatitis in childhood should be carefully treated. The milk should be fresh or sterilised, nipples and bottles should be kept thoroughly clean, and in young infants the mouth should be cleaned with a soft cloth moistened in a solution of borax or bicarbonate of soda. After thrush has appeared, the exudations should be gently removed and the mouth swabbed with a solution of boracic acid or borax.

5. GANGRENOUS STOMATITIS—CANCRUM ORIS—NOMA.

Etiology.—This is a very rare disease in this country, and is practically always found in very poor, insufficiently fed children who live in bad hygienic surroundings, in overcrowded houses, or whose personal cleanliness is not properly attended to. It frequently follows some acute disease, and especially measles, whooping-cough, or typhoid fever, which has reduced the vitality of the child. Occasionally there have been outbreaks in foundling homes where a great many children in a poor state of health have been collected. Cancrum oris sometimes follows ulcerative stomatitis. It most commonly occurs between two and twelve years of age, only very rarely in sucklings. and girls are more frequently affected than boys.

Pathology.—The immediate determining cause of the disease is certainly some form of organism ; but although many of these have been described as present in different cases, it is not yet proved what the organism is, or whether, as some hold, there are probably different forms in different cases. Whatever may be eventually proved to be the facts of the case in this respect, there can be little doubt that the predisposing cause or causes are of more importance than the actual exciting organism.

Symptoms.—The first symptom to attract attention is usually great fœtor of the breath. On examination, a dirty dark ulcer of the mucous membrane of the cheek will be seen with much surrounding induration. This extends in depth ; a dusky red spot appears on the outer aspect of the cheek, and enlarges in extent ; then a black area forms in its centre, and an opening from the buccal cavity to the outside is formed. The dark necrosed area is surrounded by a tense infiltration which gradually spreads. Sometimes a bulla may form before necrosis appears. The necrosis spreads in all directions, all tissues are involved, and considerable portions of the jaws may become necrosed.

The child is, as a rule, seriously ill ; there are marked constitutional symptoms ; the stench is extreme. There is difficulty in getting the child to take nourishment, the gastro-intestinal tract suffers, diarrhœa is frequently present. The pulse gets rapid and weak, the child usually sinks rapidly, and dies in from two to seven days. The usual cause of death is septic broncho-pneumonia; death may also result from exhaustion.

Sometimes the fœtor begins to disappear, salivation becomes less, the process ceases to extend, and recovery ensues, with, of course, considerable deformity.

Morbid Anatomy.—Beyond the necrosed area where the tissues become hyaline and stain badly, there is an area with great infiltration of leucocytes and thrombosis of the vessels, in which, and spreading from them, numbers of organisms may be seen.

The **diagnosis** is easy, and the **prognosis** bad, as a rule; about 75 per cent. of the cases die.

Treatment.—Careful treatment of all cases of inflammation and ulceration about the mouth, especially during and after acute infectious diseases, and strict isolation of every case when it occurs, must obviously be carried out. When a case has occurred, free removal of the tissues well beyond the line of necrosis, and cauterisation of the edges with the Pacquelin cautery or nitric acid should be practised. The mouth should be kept as clean as possible, by frequent washes—*e.g.*, permanganate of potash. The child should get plenty of readily absorbable nourishment, and stimulants should be freely given. In cases which recover, a subsequent operation to remedy the deformity will probably be required.

6. Other Forms of Stomatitis.

Sometimes other forms of stomatitis occur. Of these the commonest is **syphilitic**. This presents much the same features as in secondary syphilis of the adult, although affections of the mouth and fauces are not so common in congenital syphilis as in the acquired form. Mucous patches and fissures about the commissures of the lips are frequently present, and may lead to scars afterwards. **Gonorrhœal stomatitis** is seen occasionally in the newly-born. **Diphtheritic stomatitis** is very rare. When it does occur it is practically always secondary to diphtheria of the fauces.

DENTITION.

To the lay mind nothing plays a more important part in the production of disease in children than "teething." To it, especially, all forms of gastro-intestinal catarrh, skin eruptions, and nervous phenomena (particularly convulsions) are attributed. It has been definitely proved, however, that, in healthy children, teething produces, as a rule, almost no symptoms. There is usually some congestion of the gums, with exaggerated salivation; there may be some loss of appetite, restlessness, temporary rise of temperature, and general uneasiness. Vomiting and diarrhœa, however, must always be looked upon as due to some other cause, particularly to improper feeding. It is possible that, occasionally (in rickety children especially) teething may be the immediate cause of convulsions; but it must be remembered that, in these cases, the constitutional condition is the important one, and that any slight irritation is sufficient to induce such abnormal discharges from the unstable nervous system. Some children undoubtedly show a little more difficulty in the eruption of the teeth than others, and become restless, sleepless, and somewhat feverish, until the tooth has thoroughly appeared, whereupon the symptoms will abate. These cases are rare, however, and all other causes must be eliminated before the teething can be accepted as the cause of the symptoms.

Treatment.—In the few cases where teething leads to symptoms, soothing remedies, such as the bromides, may be used, and lancing the gums may give immediate relief.

GASTRO-INTESTINAL CATARRH,

Including the Diarrhœal Diseases of Infancy.

Under this head we propose to group those conditions, so prone to occur in early childhood, which are characterised by imperfect gastric and intestinal digestion, generally by diarrhœa, and frequently by vomiting and other signs of disturbance of the functions of the alimentary tract. The phenomena vary according to the part of the digestive canal most affected; somewhat rarely, however, are they entirely limited to the symptoms of pure gastric or intestinal irritation. We are aware that in many instances these diseases are attended by but little catarrh, that the symptoms are due to a local irritant such as a fermentative process, and that the slight catarrh then present is not primary, but secondary. Here, however, as in so many other morbid processes, a vicious circle is soon set up; dyspepsia, from errors in diet, causes catarrh, and the catarrh prolongs and intensifies the indigestion and fermentation. In the large majority of cases, accordingly, more or less inflammation of the gastro-intestinal mucous membrane does exist; its degree depends on several factors, of which may be named: the character of the intestinal or gastric contents, the sensitiveness of the digestive organs, and the length of time through which the irritation persists. In most cases the affection of the bowel is the prominent feature, though generally the stomach also is involved; this fact should be constantly borne in mind, even when the symptoms of gastric disturbance are but slight. In some cases, however, the stomach derangement appears in the foreground; these we deal with under the head of gastric catarrh. At present it need only be noted that, when the dyspepsia is at all prolonged, diarrhœa is almost invariably superadded. For these reasons it is convenient to associate together all forms of indigestion and diarrhœa.

Pathogenesis.—In recent years it has been conclusively shown that abnormal fermentations in the gastro-intestinal canal are the most frequent cause of these diseases. Such processes vary in character according to the nature of the food and the ferment present; in severity according to the virulence of the ferment and the duration of its action. That the resulting lesions should differ greatly is, therefore, only to be expected; between a slight catarrh and a formidable ulceration of the bowel any degree may be found. It is difficult enough to classify these conditions from the point of view of their morbid anatomy, and it is impossible to employ a pathological basis in considering cases as we meet with them at the bedside. Save in a few characteristic instances, it is usually mere hazard to diagnose a definite lesion from the symptoms observed; furthermore, similar anatomical changes do not always give rise to the same train of symptoms.

The alimentary canal of the infant is extremely sensitive, readily undergoes vascular changes, and becomes the seat of catarrh or more deep-seated lesions; its capacity is large, and absorption goes on actively. For these and for other reasons gastro-intestinal catarrh is very liable to occur, and poisoning with the toxic products of fermentation readily takes place. An irritant which in an adult will produce only acute dyspepsia, will in a child give rise to acute diarrhœa.

Cow's milk, the almost universal substitute food in infancy, forms a very suitable nidus for the growth of germs; it is often contaminated with organisms which, under suitable circumstances, speedily give rise to toxines, and this—the so-called "milk-infection"—is probably the commonest cause of gastro-enteritis with poisoning. It is not, however, suggested that every case is to be so accounted for. Indigestible food, acting as a mechanical irritant, will rapidly give rise to signs of gastric or intestinal derangement; if these persist for any length of time, fermentative processes ensue, and infection is superadded. It may, however, be quite easy to recognise that the toxic symptoms are prominent in one case, whilst in another they are of minor importance.

We prefer, then, to arrange these diseases clinically, dividing them into the acute and chronic varieties, and mentioning under each head special forms, the symptoms of which are readily recognisable. We shall treat of **acute gastro-intestinal catarrh**, with gastritis, enteritis, cholera infantum, and dysenteric diarrhœa; of **chronic gastro-intestinal catarrh**, with chronic gastritis, chronic enteritis, and catarrhal (chronic dysenteric) diarrhœa. Finally, we shall indicate, in outline, the treatment to be pursued.

ACUTE GASTRO-INTESTINAL CATARRH.

This is one of the commonest of all diseases of childhood, and, from its results, both immediate and remote, is of great importance. It varies in degree from an attack of slight digestive derangement with but little constitutional disturbance, to one where the gastro-intestinal symptoms are so acute, and the constitutional symptoms so severe, that death ensues within a few hours.

Etiology.—Acute gastro-intestinal catarrh is predisposed to by bad hygienic surroundings, by previous illness, and, in particular, by rickets; possibly, in some instances, by family proclivity, and, it may be, by teething. The last-named, though considered an all-sufficient cause by the laity, does not of itself lead to gastro-intestinal catarrh; the determining cause in almost all cases being some dietetic error. The disease is equally common in the two sexes, and is more prevalent in summer than in winter; children under two years are most liable, particularly at the period of weaning. It will be apparent that children fed on the bottle are much more exposed to the risk of gastro-intestinal catarrh than are those naturally fed. In the vast majority of cases we have to do with a decomposing article of food (most commonly milk), and an actual infection or intoxication of the patient thereby. Hence it is that imperfectly cleaned bottles so frequently bring about an attack of diarrhœa, and hence it is, too, that the disease sometimes assumes an epidemic character in the hot summer months. Summer diarrhœa, as it is called, is, however, much more common in America than in this country; the extremely acute forms of the disease, there so commonly fatal, are here of exceptional occurrence. The explanation of the close relationship to high atmospheric temperature is obvious; in such cases it is impossible, without special precautions, to preserve milk untainted for even a few hours. Organisms grow rapidly in it, fermentation occurs, and, amongst other substances, lactic and butyric acids are formed; the casein is partially peptonised, and the poisonous products of albuminoid decomposition and bacterial toxines are produced. Over-feeding, either by too large a quantity being given at a time, or by too short an interval elapsing between the meals, is also a frequent factor in the causation of gastro-intestinal catarrh; and the use of improper food, such as starches or an ordinary mixed diet, also leads to it. Dirty bottles have already been alluded to, and it is perhaps worth mentioning that when a child is seen suffering from diarrhœa the inner surface of the rubber tube of the bottle should always be examined. It will almost invariably be found covered with a thin layer of sour-smelling curd, even though it may, at first, appear thoroughly clean. To show this to the mother will often convince her, more than many words will do, of the propriety of using a suitable feeding appliance.

Children at the breast are to a great extent, but by no means entirely, exempt. When diarrhœa occurs in them it is generally due to over-frequent feeding—the consequence usually of giving the breast whenever the baby cries. Very often, too, it is due to the use of some addition to the food, such as biscuit. Breast-milk, however, may itself be at fault, from such causes as excessive richness of the diet, the abuse of alcohol, the use of certain drugs, emotional disturbance, illnesses of various kinds, the onset of pregnancy, or (rarely) the occurrence of menstruation. Exposure to cold sometimes plays an important part in the production of the disease.

Occasionally, also, digestive disturbances may be due to the too free administration of such drugs as mercury, arsenic, &c., or to the over-use of purgatives.

Symptoms.—The symptoms vary very greatly in different cases. In a severe case the child becomes restless and agitated, cries a great deal, and appears to be in pain. The legs are drawn up, the abdomen is distended, hard, and often tender. The temperature is raised, it may be to 103° F. or higher, the pulse is rapid, 110 or more, the skin is dry, and nervous symptoms, such as slight twitchings or even convulsions, may develop. Diarrhœa sets in and is often associated with vomiting. The bowels act frequently, six or eight times in the day or even more often; the stools, at first fæcal and but slightly more fluid than normal, increase in number and become paler and watery, or assume a green colour. The cause of this colour is still obscure, but it is possibly associated with an increased secretion of bile. After the diarrhœa has continued for a day or two the stools become acid and fœtid, contain undigested food, and are of so irritating a character that intertrigo and excoriations about the anus are almost constantly produced. The movements of the bowels are usually associated with a considerable amount of pain, and with the escape of flatus. From the pain and the character of the stools we can gain some information as to the part of the bowel chiefly affected. If, before the bowels act, there is paroxysmal crying, and drawing up of the legs on the belly, these symptoms being followed and relieved by the passage of a copious fluid motion, we infer that we have chiefly to do with a catarrh of the small intestine. If, instead of preceding, the discomfort occurs along with the action of the bowels, and if the stool is small and followed by crying and straining efforts, the colon is evidently the chief seat of irritation. In such cases there may be a little blood streaked over the fæces, its source being the rectum; but it is rare to find a truly hæmorrhagic stool. There may be, too, a little prolapse of the anal mucous membrane, but in ordinary acute gastro-intestinal catarrh there is seldom any great excess of mucus in the fæces. According to the extent to which the stomach is implicated, vomiting will be a more or less frequent accompaniment. It may immediately succeed each act of sucking, or some little time may elapse before the stomach is emptied.

If the disease lasts for any considerable period, further constitutional symptoms develop. There is great apathy or torpor, and the patient sinks into the typhoid state. The tongue is at first coated with a yellowish or whitish fur with perhaps red edges, but later it may become dry and brown. There is great thirst, the eyes become hollow and the pupils dilated, the pulse remains rapid and becomes feebler, and the fontanelle sinks. With the progressive weakness the body-weight diminishes, the temperature may keep high and is said, at times, to be higher over the abdomen than over the rest of the body; but later it may fall to subnormal. Finally, the child may die comatose or in convulsions. Very often, however, after a day or two gradual improvement sets in, vomiting ceases, the stools decrease in number, the tongue cleans, and the pulse and temperature fall. In other cases recovery is rapid, there being a sudden fall in temperature and pulse, and this crisis is often preceded by green stools even where these have been quite absent before. Again, after partial recovery, a relapse may occur; this may prove fatal or may be the precursor of the condition becoming chronic.

Having dealt with severe gastro-intestinal catarrh, we may dismiss the slight cases very briefly. A few attacks of diarrhœa, with or without vomiting, a normal or slightly raised temperature, and slight distension and tenderness of the abdomen may constitute all the symptoms present. Between such cases and those already described all grades of intensity exist.

Among the **complications** of gastro-intestinal catarrh may be mentioned patchy congestion of the lungs—the physical signs varying in position from day to day, parenchymatous nephritis, meningitis, and thrombosis of the cerebral sinuses. Nervous symptoms may follow the last two of these, but they are by no means diagnostic of them, being often due solely to the toxæmia.

The **diagnosis** is easy. It is important to decide in any given case whether much absorption of poison from the alimentary canal is taking place. A high temperature and rapid pulse, enlargement of the spleen, great pain, and abdominal tension, all point in the direction of a somewhat acute infection. With a view of estimating the amount of digestion going on, the dejecta ought always to be examined; and a reference to the conditions outlined above, and to the symptoms afterwards described in speaking of gastric catarrh, will generally enable some conclusion to be arrived at as to the chief seat of the irritation, whether it be stomach, small intestine, or colon.

The **prognosis** depends largely on the age and strength of the child, and on the extent to which the necessary remedial measures can be carried out. It is less favourable in weakly and rickety children, more favourable in those on the breast. The chief determining factor, however, is the severity of the symptoms, and, particularly, the amount of drain on the tissue juices, and the intensity of the toxæmia. Cases where vomiting prevents the proper nourishment of the child, and those where nervous symptoms supervene, are always to be regarded as serious.

ACUTE GASTRIC CATARRH—ACUTE DYSPEPSIA.

The cases vary in severity from simple acute dyspepsia, without local lesions of any importance, to acute gastritis. In the majority of cases occurring in young children, gastric catarrh precedes or complicates intestinal catarrh; hence the justification for discussing the subject in this section.

The **etiology** is practically the same as that of the preceding condition, but considerable stress must be laid on exposure to chill, as when the arms and legs are allowed to remain bare. That some children inherit a tendency to disorders of the stomach from slight causes appears probable.

Uncomplicated gastric catarrh is more a disease of late childhood than of infancy, and is brought about chiefly by the use of unripe or over-ripe fruits, or excessive quantities of sweets, pastry, and the like. It also occurs at the beginning of many acute illnesses.

Symptoms.—In well-marked cases there is considerable constitutional disturbance; fever, rapid pulse, and, possibly, an outbreak of herpes labialis, very much as has been described under gastro-intestinal catarrh. In mild cases the initial symptoms are to a great extent absent. The child becomes restless, cries, and is obviously in pain; the abdomen is resistant, the epigastrium tender, and vomiting sets in. Thirst is a prominent symptom, and is shown by the craving for the breast or for cold water, the fluid being in many cases rejected by the irritable stomach as soon as swallowed. The tongue is covered with thick whitish yellow fur, the appetite is completely gone, and the breath is foul. Vomiting usually follows immediately on the ingestion of food, and in older children there may be a good deal of nausea and retching. Headache is often so severe, that we may be in doubt whether we are not really dealing with a case of enteric fever or meningitis. The vomited matters consist of food and mucus; later on they may become bilious, or watery and frothy, or may even be tinged with blood. As the irritant or fermentative products pass into the bowel, diarrhœa is set up, and the case becomes one of gastro-intestinal catarrh. In some cases nervous symptoms are reflexly excited—*e.g.*, convulsions, irregularity, and even slowing of the pulse, &c. To a peculiar condition of dyspnœa, associated with rapid superficial breathing, quick feeble pulse, and slight cyanosis, immediately relieved by the emptying of the stomach, Henoch has applied the name *Asthma dyspepticum.*

Diagnosis.—The chief error into which the physician is likely to fall is that of mistaking the earlier symptoms of meningitis and typhoid fever for those of gastric catarrh. The greater evidence of stomach disorder, the coated tongue and foul breath of the latter, and the absence of cerebral symptoms—especially the sighing breathing—and (usually) of irregularity and retardation of the pulse, serve to distinguish it from meningitis; in typhoid, the further course and, especially, the temperature curve are sufficient guides. Where any doubt exists, however, it is wise to suspend judgment, and await events. The possibility of the stomach derangement being merely the onset of some infectious disease should be remembered.

Acute Intestinal Catarrh.

In some cases we may have the general symptoms of a gastro-intestinal catarrh minus those referable to implication of the stomach. Such may be regarded as cases of pure intestinal catarrh.

CHOLERA INFANTUM—CHOLERAIC DIARRHŒA.

Etiology.—This terrible disease occurs chiefly in artificially fed or prematurely weaned children; it is almost exclusively met with in the summer months, and often assumes an epidemic form. The exact cause is as yet unknown, but the disease only occurs with high external temperature. It is therefore more common in countries whose climate is continental than in England.

The **symptoms** pretty closely resemble those of true Asiatic cholera, and may admit of division into two stages—the initial and the algid. Very often, however, the first of these is very short or even absent. The disease may occur suddenly in a child who is comparatively healthy, or may appear in one already suffering from gastro-intestinal catarrh. The chief symptom is diarrhœa, accompanied in most cases by vomiting, and preceded by a rise of temperature. The stools are at first large, fluid, yellowish-green or brown, and very frequent—perhaps twelve or fifteen in twelve hours. The child is restless, attacks of colic occur, the abdomen is distended and tender. The tongue is furred, and soon becomes dry and cracked; the thirst is intense, and slight convulsive movements of the head, eyes, or arms may be seen. This first stage lasts only a few hours, as a rule, and is succeeded by typical choleraic phenomena. The diarrhœa and vomiting become worse; the stools are copious, watery, odourless, and alkaline in reaction; they contain small seed-like bodies, and, on microscopic examination, numerous bacteria are seen. The child's eyes become sunken and covered with mucus, and on raising the half-closed lids pressure-indentations on the sclerotic may be seen. The face is pinched, the nose and ears turn blue, the patient becomes extremely collapsed and lies in a torpid condition; twitchings of the limbs, unconscious movements of the fingers, and, not infrequently, retraction of the head, supervene. The breathing is quick, the pulse feeble and rapid, though, occasionally, its rate may fall to 50, 40, or even lower. Although the rectal temperature is raised and continues to ascend up to, and even after, death (106° to 107° F.), the skin is cold and the surface temperature subnormal. Owing to the great loss of the fluids of the body the skin hangs loose and shrivelled, the urine is suppressed, the weight rapidly diminishes, the fontanelle sinks, and the cranial bones overlap. Convulsions or coma occur towards the end, and these, together with the appearances of the skull already described, form the clinical picture known as hydrencephaloid. If the temperature falls very low a condition of sclerema may result; and it has been suggested that this is due to solidification of the fat by the low temperature. When the disease proves fatal it usually does so within two days. Only in a minority of cases does recovery ensue, and in such event the stools become less frequent and more solid, the respirations are more regular, the strength of the pulse increases, and the nervous symptoms pass away. Occasionally, the passage of several green stools heralds recovery.

Numerous **complications** may ensue. The chief are pneumonia, gangrene of the umbilicus, hæmorrhages, suppurations in various organs, and thrombosis of the cerebral sinuses.

The **diagnosis** is obvious, the **prognosis** grave.

DYSENTERIC DIARRHŒA—DYSENTERY OF CHILDREN—ACUTE ILEO-COLITIS, &C.

This form of inflammation of the bowels chiefly or exclusively affects the large intestine and the lower part of the small intestine.

Pathogenesis.—The causes of dysenteric diarrhœa are much the same as those already described in treating of gastro-intestinal catarrh. It has occasionally occurred in epidemic form. There can be little doubt of its infective nature, and various attendant micro-organisms have been described, but their relations to the disease are as yet far from being established. The malady is usually seen during the first two years of life, but may occur as late as the fifth year.

Symptoms.—The disease may develop suddenly or may be preceded by diarrhœa of a few days' duration, or by chronic intestinal catarrh. The initial symptoms are fever, with rapid pulse, hot dry skin, severe colic, and looseness of the bowels. At first the stools are greenish or brown and consist chiefly of fæcal matter ; soon, however, mucus appears in them and the fæcal character gradually decreases till the motions are composed almost entirely of mucus, which at first is clear but soon becomes brown, or reddish-brown, from the admixture of blood. Tenesmus is a marked symptom, and the patient may pass from twenty to forty small, extremely offensive motions in the day. In some cases the mucus is in the form of white or, more usually, brown ribbons ; when white, these may resemble fragments of tape worm ; there is considerable distension of the abdomen, and tenderness on palpation, especially along the line of the colon. Vesical tenesmus is often associated with the diarrhœa ; the skin around the anus becomes irritated and inflamed, the sphincter is relaxed, and slight protrusion of the mucous membrane, or even actual prolapse of the rectum, may ensue.

The beginning of an attack is often accompanied by vomiting, and this may continue throughout the course. In severe cases the patient sinks into a typhoid state and dies within one or two weeks. The first signs of recovery are a slight cessation of the diarrhœa, and the reappearance of fæcal matter in the stools. In favourable cases convalescence may be complete in from ten to fifteen days. Frequently, however, the condition becomes chronic and lasts for weeks or months, and relapses may occur, one of which may prove fatal.

The **diagnosis** is easy. The **prognosis** is better in temperate climates than where extremes of heat and cold occur ; and the severity and course of the disease are much influenced by the surroundings of the patient. Broncho-pneumonia, which sometimes follows dysenteric diarrhœa, makes the prognosis much worse. The re-appearance of fæcal matter in the stools is a favourable sign.

CHRONIC GASTRO-INTESTINAL CATARRH—CHRONIC INDIGESTION.

This has its origin in the same causes as the acute form, and may result from the latter, or develop insidiously from dietetic error, especially bad milk. Neglect and bad hygienic conditions are important factors in its production.

Symptoms.—Although the appetite may be fairly good, and even voracious, the child does not thrive. Some time after meals it becomes restless, and there may be vomiting, the vomited matters being usually very sour and mixed with a considerable quantity of mucus. At varying intervals intestinal colic occurs, the child cries out, draws up its legs, and is covered with sweat; but the passage of flatus relieves the paroxysm and gives the patient rest for a time. The diarrhœa is not, as a rule, excessive, two or three stools being an average number, but six or eight movements of the bowels in the course of the day are not uncommon. The motions are usually acid and foul smelling, but their appearance varies from pale and pasty, or frothy, to darker and more liquid, while at times they assume a green colour, and undigested food, especially particles of casein and fat, is often present. From the fact that the stools are not always fluid, the mother may not regard them as abnormal; it is therefore necessary, not merely to ask if there is diarrhœa, but to enquire how many motions there are in the day. Diarrhœa is, however, not invariable, the bowels may be constipated, and oftentimes the constipation sets up, and alternates with, attacks of diarrhœa.

With these symptoms there is much wasting, the child becomes thin, the muscles are soft, and the skin lies in wrinkles about the buttocks and groins, and can be raised in folds from the subjacent tissues. Though not, as a rule, tender, the abdomen is distended with gases, and it is often easy, in young infants, to observe the peristalsis of the dilated coils of the small intestine. Visible peristaltic movements, therefore, are not by themselves an absolute sign of intestinal obstruction. The enormous abdomen contrasts very markedly with the emaciated legs and thorax, and the skin over it is often covered with crops of sudamina from the sudden outbursts of sweat caused by the paroxysms of colic. There is frequently some irritation about the buttocks and perineum, and the anus appears relaxed or slightly patulous, showing the lining mucous membrane. Transient attacks of feverishness and sweating may occur; the tongue is furred, and thrush is often seen in the mouth. The face is thin, the eyes sunken, and the fontanelle depressed; the urinary secretion is usually diminished

Temporary recovery, with relapses, is common, and if the diet be not properly regulated the course is often a downward one. The emaciation increases, the temperature becomes subnormal, and œdema of the dependent parts sets in. If the disease be prolonged, the catarrh tends to become localised to the colon, and then we have to deal with the condition of catarrhal diarrhœa or follicular enteritis.

The **prognosis** depends largely on how the treatment is carried out. With due attention to diet recovery may be expected, though, in the majority of cases, great patience, as well as great care, is required. The longer the disease continues, the more intractable does it become ; directly or indirectly, therefore, it is a not infrequent cause of death.

CHRONIC GASTRIC CATARRH.

Etiology.—The disease may follow an attack of acute gastric catarrh, or may be chronic from the first. Its causes are, therefore, the same as those already mentioned, and it is especially liable to occur in the train of such diseases as anæmia, rickets, fevers, &c.

Symptoms.—The chief symptom is vomiting, to which are generally added malnutrition and derangement of the bowels. Vomiting may occur immediately after meals, the vomited matters then consisting of unaltered food (or, in the case of milk, of curd) having a sour smell owing to the presence of lactic and butyric acids. If the act be delayed the vomit is watery or frothy, and contains undigested food—such as hard lumps of curd surrounded and mixed with tough, stringy mucus. There is usually discomfort before vomiting, as evidenced by the pained expression, restlessness, and crying ; the emptying of the stomach affords temporary relief.

The bowels are usually constipated, and undigested fat and casein appear in the stools. When the condition lasts for any length of time, however, attacks of diarrhœa and other signs of intestinal catarrh supervene, so that the condition becomes the same as that described in the preceding section.

For the rest, the tongue is coated with thin, whitish or yellowish fur, the edges are sometimes red and irritable, there is great thirst, and, in addition to these symptoms, loss of weight and malnutrition are practically always present.

CHRONIC INTESTINAL CATARRH.

The symptoms of chronic catarrh of the intestine may exist apart from any gastric affection.

CATARRHAL DIARRHŒA—CHRONIC DYSENTERIC DIARRHŒA—FOLLICULAR ENTERITIS—CHRONIC ILEO-COLITIS.

Etiology.—This variety may arise from an attack of acute dysenteric diarrhœa, but in the majority of instances follows an ordinary case of acute or chronic gastro-intestinal catarrh, and in such event is very frequently due to the giving of ordinary food to the child before he has quite recovered.

Symptoms.—The diarrhœa continues; the stools, though not very frequent (perhaps five or six in the day), consist to a large extent of greyish, greenish, or brownish mucus, with only a small admixture of fæces. The reaction is acid, the smell very offensive, and occasionally a little blood is present. The swelling of the abdomen is seldom very great, though, from distension of the transverse colon, there may be seen some prominence of the epigastric and umbilical regions. Little tenderness is noticed on palpation. Tenesmus is by no means a marked symptom, and colic is practically absent; there is, however, a good deal of excoriation about the buttocks, and tendency to prolapsus ani. The child does not thrive, the dry, earthy-coloured skin hangs in folds about the buttocks and groins, the subcutaneous fat disappears, and the weight diminishes. Indeed, the emaciation may be so excessive that the child becomes a mere skeleton, with hollow eyes and prominent bones covered by unnatural-looking skin. The feeble circulation is shown by a small, weak pulse and œdema of the extremities; the temperature is subnormal or slightly febrile; and various nervous disturbances, such as grinding of the teeth, night terrors, irritability, &c., tend to develop.

The appetite is often excessive, but, as a rule, the more food the patient takes the less does he thrive; the tongue becomes dry and brown, and the lips fissured, whilst thrush tends to appear in the mouth. Death ensues from asthenia, or from some intercurrent malady, such as broncho-pneumonia.

Course.—The disease is chronic and usually lasts several months. Recovery is gradual, the stools diminish in number and become fæcal, the child gains weight, and the skin resumes its normal colour and elasticity. The prolonged convalescence is apt to be retarded or checked by relapses. The danger of a tubercular infection must always be recollected.

Diagnosis.—The chief difficulty is to exclude tubercle of the bowel. In this there is usually a history of chronic ill-health; pus may be found in the stools; there is often some abdominal tenderness, the temperature curve is more irregular, whilst tubercular lesions may be found in other organs.

MUCOUS DISEASE.

Under this name Eustace Smith describes a form of chronic gastro-intestinal catarrh occurring in children after the period of first dentition. It most frequently occurs during the period of debility following measles or whooping-cough, and in many instances follows a simple gastric catarrh. The chief causes are, therefore, dietetic errors and imperfect mastication of food (often from carious teeth) in children who have been previously enfeebled.

Symptoms.—The symptoms are those indicative of a catarrh, with exudation of a large quantity of mucus, involving the whole alimentary tract. The appetite, at first excessive, gradually becomes poor; the tongue is large and flabby, slightly furred, and has a remarkable shiny appearance, as if smeared over with white of egg. Abdominal distension and colic are not uncommon, and vomiting is a prominent symptom, the vomited matters being mixed with excessive quantities of mucus. The functions of the bowels are also deranged, the stools contain mucus, and constipation alternates with diarrhœa, the attacks of the latter being associated with vomiting and headache. When, after one of these attacks, a large quantity of mucus has been expelled, the child appears relieved and remains better for some little time.

The skin of patients suffering from mucous disease is rough, dry, and sallow, and, in many instances, certain nervous symptoms develop. Thus, moroseness and irritability of temper, disturbances of sleep, such as night terrors, enuresis, and somnambulism, fainting fits, and even convulsions, may be observed. The so-called "stomach cough" so often present is due, in most cases, to chronic pharyngitis.

Diagnosis.—The sallow complexion, the peculiar appearance of the tongue, the irritable temper, and the mucous vomiting and diarrhœa, together with the nervous symptoms already mentioned, make up a clinical picture not likely to be mistaken. As in other chronic wasting diseases, the important point is to exclude tubercle, and here, as elsewhere, a persistent evening rise of temperature is one of the most important guides.

MORBID ANATOMY.

It is not necessary to describe the anatomical changes found in the various inflammations of the alimentary tract with any degree of fulness. In acute gastro-intestinal catarrh there is increased secretion of mucus, with redness and swelling of the mucous membrane—in mild cases, of the villi and valvulæ conniventes only; in severer cases, of the whole of the mucosa. Sometimes exfoliation of the epithelium leads to the formation of small ulcers. These lesions are usually localised, or, at least, more marked at some parts than at others, but they may be general. In gastritis the glands may be destroyed, follicular abscesses or superficial ulcers may be present, and, in severe cases, extravasations of blood may be found. In simple intestinal catarrh the jejunum and ileum are the chief seats of the inflammation. When intestinal catarrh has lasted for some time there is, as we have seen, a tendency for catarrhal diarrhœa to appear, and then the lower part of the ileum and colon are chiefly affected; the chief lesions being swelling, and perhaps ulceration, of the solitary glands and Peyer's patches, infiltration and thickening of the mucosa, and enlargement of the mesenteric glands. Occasionally, chronic intestinal catarrh leads to atrophy of the bowel. In acute dysenteric diarrhœa the lower part of the small intestine and colon are inflamed, the solitary and agminated glands are much swollen and ulcerated, the ulcers often become confluent and are covered by fœtid pus and debris. A membrane may even be present.

In cholera infantum the intestines are usually in a state of acute catarrh, and catarrhal ulcers may be present, whilst the bowel is filled with a watery fluid similar to the evacuations occurring in the course of the disease. At times, however, there is surprisingly little evidence of any inflammatory condition.

In all acute and chronic intestinal catarrhs the mesenteric glands are liable to swell, the spleen is usually somewhat enlarged, and the liver may be enlarged and fatty.

TREATMENT.

We shall consider the treatment, in the first place, of acute gastro-intestinal catarrh; secondly, of chronic gastro-intestinal catarrh; and thirdly, of the special varieties of the disease.

Though subsidiary to the dietetic treatment, the hygienic and general surroundings are of great importance. Fresh air and due attention to bathing are, especially in chronic cases, important means of promoting the recovery of the patient. The child should be taken out into the air for some time every fine day.

Diet, however, is of prime importance; hence, it is by no means a matter of indifference which of the forms of feeding we employ in the various cases we meet with. Briefly, it may be stated that casein and fat tend to maintain an existing diarrhœa, and that milk should, therefore, be considerably diluted with water or with lime-water, boiling being also advisable. Entire abstinence from milk for a short time is frequently desirable; and such substitutes for milk as egg-albumen mixture and whey (which are, of course, only of moderate nutritive value) find their chief indication by enabling milk to be thus dispensed with for the time being. Raw meat juice is at times useful, but meat-extracts, beef-tea, and such like preparations are, as a rule, to be avoided, because of their tendency to cause diarrhœa. The liability of carbo-hydrates to undergo fermentation in the alimentary canal usually contra-indicates their use in the diarrhœas of infancy.

Acute Gastric and Gastro-intestinal Catarrh.—In infants our first care is to discover the exact error of diet committed, and to correct it accordingly. In the severer cases, which usually occur in bottle-fed children, it is well to stop all food for a period of twelve to twenty-four or thirty-six hours, and to allow the child nothing but water to drink. Though it is sometimes impossible to convince parents of the necessity of this, we can arrive at much the same result by prohibiting milk for a similar period, and replacing it by egg-albumen and water, or perhaps whey. As a rule, the vomiting and diarrhœa diminish under this diet, and we may then cautiously again begin to use milk. According to the severity of the case the milk should be largely diluted with water, diluted with the addition of lime-water, or peptonised. In all cases the milk should be sterilised, and the dilution must be considerably greater than when given to a healthy child of the same age. Should it again disagree, it must once more be withdrawn and egg albumen and water, whey, or perhaps raw meat juice, substituted. If milk be tolerated only when peptonised, the peptonisation should be continued till the symptoms have passed off; then the process ought to be gradually diminished in duration till plain boiled milk (diluted) is again given.

In the milder cases less active measures suffice; it may be enough to discard the ordinary feeding-bottle, to boil the milk, to dilute it more than usual—preferably with some lime-water—and to feed either from a tubeless bottle or with a spoon. In some circumstances a wet nurse is of the greatest value.

When recovery is complete the patient must be carefully dieted on the lines laid down in the chapter on Infant Feeding.

In older children—those already on a mixed diet—it is usually sufficient to restrict the food to diluted boiled milk, and as the symptoms pass off to add clear soups, jellies, and light farinaceous substances. It is in convalescence from gastric and gastro-intestinal catarrhs in these cases that artificial foods seem particularly applicable.

The next indications for treatment are to get rid of the irritating substances in the alimentary canal, to allay or check fermentation, and to soothe the irritated mucous membrane. The first is partly effected by the vomiting and diarrhœa usually present—nature's efforts to throw off the poisons. We may rapidly empty the stomach by washing it out with boiled water or normal saline solution; this done at the beginning of an attack is usually of great value, but in private practice there is some objection to its use. A purgative should always be administered at the beginning of the treatment, and the most useful drugs, probably, for this purpose are castor oil—one to two teaspoonfuls for a child of one year—and calomel in doses of 1 or 2 grs. Lavage of the bowel is indicated more especially when the large intestine is chiefly involved. The child should be allowed plenty of water to drink, whereby the alimentary canal is cleansed to some extent, its contents diluted and possibly rendered less toxic, the drain on the tissue juices partly replaced, and thirst alleviated.

When the bowels have acted freely, the second indication (allaying or checking of the fermentative processes) has to be considered. Very many drugs have been employed for this purpose, but probably the most generally useful is calomel in doses of $\frac{1}{6}$ to $\frac{1}{4}$ gr. two or three times a day, according to the age of the child. When given in this way, rubbed up with a little white sugar, calomel has no purgative action, the stools become fewer and less fluid, and in the course of a day or two the diarrhœa ceases. We may use along with the calomel, or alone, sub-nitrate of bismuth in doses of 4 or 5 grs. or more to a child of six months. Salicylate of bismuth may also be employed, but must be given in smaller doses—1 or 2 grs.—and is not so generally useful. Amongst other drugs which are useful in this treatment dilute hydrochloric acid may be specially mentioned. Given in doses of 1 minim every three or four hours to a child of six months it often produces capital results; it is frequently, and with advantage, combined with very small doses of tinct. opii. Various other antiseptic remedies, such as naphthalene, creasote, β-naphthol, and salol, may be employed with benefit; liquor hydrargyri perchloridi is not nearly so useful as calomel.

Of sedatives, bismuth is the most generally useful, for it acts both as an antiseptic and as a sedative. Opium in the form of Dover's powder, $\frac{1}{8}$ to $\frac{1}{4}$ gr., or tinct. opii, $\frac{1}{6}$ to $\frac{1}{3}$ minim, may be given to a child of six to twelve months old; its action is often very beneficial, but as children are susceptible to opium, a careful watch must be kept on the action of the drug. It may be laid down, as a rule, that opium should never be given till the bowel has been cleared out, else retention of the contents will ensue and the condition may be aggravated. In urgent cases morphia ($\frac{1}{100}$ gr.) may even be employed hypodermically.

When the disease has lasted some time astringents are often very useful. Of these, chalk, tannic acid and its derivatives, nitrate of silver ($\frac{1}{20}$ gr. every two hours), or acetate of lead ($\frac{1}{8}$ gr. every two hours) may be mentioned.

The general condition of the child may necessitate further treatment. Thus, feebleness, collapse, a sunken fontanelle, and cold extremities call for the use of stimulants; in such cases enemata of hot water, warm baths, and packs will also prove beneficial. The temperature may of itself prove dangerous; therefore, when it runs very high, cooling baths and packs should be resorted to.

To summarise the treatment of acute gastro-intestinal catarrh we may say that the dieting is of the first importance, and that drugs, though secondary, are of great value. After the bowels have acted freely, either with or without the use of purgatives, the remedies in their usual order of applicability are calomel in small doses, bismuth, dilute hydrochloric acid and opium, intestinal antiseptics, and astringents. Collapse and high fever require the usual treatment.

Chronic Gastro-intestinal Catarrh.—Here, again, the regulation of the diet constitutes the principal element in the treatment. In infants at the breast, where the mother's milk disagrees, a wet nurse may be procured; if, as is usually the case, this is impossible, the child should be weaned and dieted in accordance with the rules laid down in the chapter on Infant Feeding. Most cases of chronic digestive disturbance, however, occur in bottle-fed children; and, after correcting any obvious fault, such as lack of cleanliness, and regulating the diet in the ordinary way, it is often sufficient to dilute the milk still further than in the case of a healthy child of the same age—*i.e.*, to diminish the amount of casein and fat in the food. If this fail it will be necessary to employ peptonised milk, substitute whey for milk, or use raw meat juice.

Plenty of fresh air is essential, and benefit frequently results from a change to a different district. Cold sponging or douching usually proves advantageous. In older children it is well to limit the quantity of starchy and fatty elements in the food; indeed, a temporary return to a purely milk diet is the best means of treatment at our command.

Whilst an occasional dose of castor oil or calomel may be of use, the constant employment of drugs which act on the bowel is, in general, to be deprecated. Ipecacuan is probably one of the most useful remedies; salol, bismuth, &c., are of less value. General and gastric tonics are of great benefit; an alkali and bitter, such as the ordinary soda and gentian mixture, with the addition of a little nux vomica, is very suitable in many cases. If well borne by the stomach, malt may be of use by assisting in the digestion of the starches. The children are usually so wasted and puny that the idea of cod-liver oil immediately suggests itself. It is, however, quite useless to give it so long as the gastro-intestinal catarrh persists, though when the tongue is clean and the digestive trouble over it may be administered with advantage.

Acute Gastritis.—Where vomiting is marked the irritant will usually have been got rid of. If any doubt exists, drinks of tepid water should be given, which, being speedily returned, will wash out the stomach. Lavage of the stomach, ipecacuan, or mustard and water may be used for a similar purpose. If after this has been done a purge can be retained it is well to give one; then our further treatment is directed towards allaying the irritation and the vomiting. Abstinence from food, and, in older children, swallowing small pieces of ice, and poulticing with mustard and linseed over the abdomen are often sufficient. Of sedative drugs, bismuth sub-nitrate, dilute hydrocyanic acid, alkalies, and opium are the most useful. To quench the thirst water should be sipped, or, if it is rejected by the mouth, enemata of saline solution should be used. The return to an ordinary diet should be very gradual.

Cholera Infantum.—Here our treatment must be prompt. The stomach and bowel should be irrigated with warm saline solution at once; by injecting slowly and gently it is probable that some of the water may pass beyond the ileo-cæcal valve, and so act on the small intestine. A purgative may also be given, but it is apt to be vomited, and, besides, acts rather too slowly to be trusted to in such an acute disease. In the early stage of the disease opium is a drug of value; later, when the child is cold, drowsy, or enters on the condition of hydrencephaloid, it is absolutely contra-indicated. General stimulants are required after the early stage, and two important indications are to maintain the body heat by warmth—*e.g.*, baths, hot bottles, hot injections, &c., and to replace the fluid abstracted from the body. The latter may be effected by hypodermic injections of 4 to 6 ozs. of saline solution several times a day.

Dysenteric Diarrhœa.—After the food has been strictly limited, and an initial purgative given, as in acute gastro-intestinal catarrh, irrigation of the colon several times a day should be carried out. Large quantities of ordinary tepid water or normal salt solution may be used, or a little opium may be added. Occasionally a small quantity of an astringent may be added to the douche. As to drugs, bismuth is probably the best; the subnitrate may be given up to 2 drs. daily for a child one year old. Other drugs which are insoluble, and so act on the lower part of the bowel, are also beneficial—*e.g.*, calomel, naphthalene, &c.

Catarrhal (Follicular) Diarrhœa.—The diet must be carefully regulated as in chronic gastro-intestinal catarrh. Local treatment is of most service—viz., irrigation of the bowel, with subsequent astringent enemata of alum, hazeline, tannic acid, nitrate of silver, &c. By the mouth, castor oil at intervals, considerable doses of bismuth, ipecacuan (several grains with or without opium), nitrate of silver, acetate of lead, and red gum may be used. In some cases the use of petroleum emulsion has a distinctly beneficial effect, both on the local and general condition.

Mucous Disease.—The most important dietetic measure is the exclusion of all starchy substances in the food. Milk, soups, white meat, and, more sparingly, red meat, and even green vegetables may be given. All bread used (and the quantity should not be large) had better be toasted. The quantity taken at each meal should be small, and the intervals between meals should be of four to five hours' duration. The bowels should be regulated by the use of alkaline mineral waters; by preventing constipation we obviate the tendency to attacks of diarrhœa. Nux vomica and aloes are also useful. Before meals a simple alkali and bitter should be given. The mineral acids are worse than useless, and cod-liver oil should not be administered until convalescence is well established. Attention should be paid to the condition of the skin. Frequent tepid baths and subsequent inunction with oil have a beneficial tendency.

Lienteric Diarrhœa.—This form of diarrhœa, which occurs in older children rather than in infants, and comes on immediately after a meal—the stools consisting largely of undigested food, is of importance chiefly from the point of view of its treatment. In general this is the same as in any other intestinal catarrh, but where the usual drugs fail, liquor arsenicalis given in doses of 1 minim immediately before meals very often checks the condition.

DILATATION OF THE STOMACH.

Etiology.—Much attention has of late been directed to this subject, especially by French writers. It is said to be very common about the time when the child is weaned, or towards the end of first dentition, if the child has been bottle-fed. Unsuitable food or ill-regulated meals lead to decomposition of the ingesta, with formation of gases in the stomach, and to the production of gastric catarrh, which weakens the resisting power of the muscular wall. The result is that the stomach becomes more or less permanently dilated. If the child be anæmic, or in a weak condition from any cause, the tendency to dilatation will be increased. Much stress has been laid on the relationship of gastrectasis, with or without dilatation of the bowel, to the production of rickets. It is assumed that from the distended stomach and bowel poisonous substances, which are the cause of rickets, are absorbed. In this connection the fact that tetany occurs at times in dilatation of the stomach in adults is adduced as a further proof of the correctness of this theory, tetany in childhood being a very common accompaniment of rickets. It has also been supposed that dilatation from improper feeding at this period of life is a frequent cause of the gastrectasis found in later life.

In older children dilatation occurs in cases where there has been injudicious dieting, especially in the direction of too large or too frequent meals. The condition is apt to come on after acute diseases.

Symptoms.—The symptoms are chiefly those of the accompanying catarrh. The appetite is often increased in the earlier stages, but as time goes on it fails, discomfort follows every meal, and although it is relieved for the time being by eating, the added food soon feeds the fermentative processes in the stomach. Whatever be the state of the appetite, thirst is a constant symptom. Vomiting of sour-smelling matters occurs from time to time; there is often constipation; undigested food may appear in the stools, and attacks of watery, bilious, or mucous diarrhœa may supervene. Borborygmi are frequently heard, and there is often some general abdominal discomfort. The other systems of the body suffer; irritability, restlessness, sleeplessness, pavor nocturnus, and even convulsions may ensue; attacks of asthma and urticaria or other skin eruptions may occur.

The recognition of the disease, however, rests on the physical examination of the abdomen. Succussion sounds are not reliable evidence of gastrectasis unless we can be sure that they do not occur in the colon, and that at the time they are found some hours have elapsed since fluid was taken. The most satisfactory method of physical diagnosis at our command is the combined auscultation-percussion method. This we have employed in a large number of out-patients, and we have not been able to make out the frequent occurrence of dilatation of the stomach. Even in rickets we have found only a very small proportion of children where the lower border of the stomach approached the level of the umbilicus, and as in some of these there was considerable constriction of the chest the lower level of the stomach was probably due, partly at least, to depression of the stomach apart from dilatation. That succussion sounds are frequently produced in the colon in cases of rickets is undoubted, and this source of error must be carefully excluded. When dilatation of the stomach, and especially of the bowel, occurs in rickets, it is probable that the dilatation is the result of the rickets, for it is well known that muscular weakness is a prominent feature in that disease.

Treatment.—Careful regulation of the diet is essential; the meals should not be too large, there should be a sufficient interval between them, and starches should not form part of the diet of young infants. In older children attention to the condition of the teeth, abstinence from pastry and sweets, and proper mastication should be insisted on, as well as the usual dietetic and medicinal measures used in adults.

CONGENITAL HYPERTROPHY OF THE PYLORUS.

Morbid Anatomy.—Considerable attention has recently been drawn to this condition, in which there is found, on post-mortem examination, a great increase in the muscular development of the pylorus, with narrowing of its orifice. The mucous membrane is consequently thrown into folds, the stomach is more or less dilated, and at the pyloric end the walls are thickened, whilst at the cardia they are thinner than normal.

Etiology.—The condition is found in very young infants; instances have been recorded of several members of a family having been affected, but the parents are usually healthy, and no other morbid condition has been found specially associated with it. Dr. John Thomson has suggested that it may be due to ill-co-ordinated and antagonistic action of the muscular tissues of the stomach and pylorus, and hence that it should be named **Congenital Gastric Spasm.**

Symptoms.—In some cases vomiting commences immediately after birth, but in most instances it does not supervene until a week or two later. The vomiting is constant and forcible, and occurs, as a rule, soon after meals, but may be delayed. Alteration of the diet leads to no lasting improvement, and the child becomes gradually emaciated. The abdomen is lax; the stomach is distended, and at times the pylorus may be felt as a small, hard, movable, ball-like structure. The stools are infrequent but not otherwise abnormal; the secretion of urine is scanty.

The **prognosis** is bad; nevertheless some cases, which presented all the signs of the disease, have recovered.

No **treatment** is of much avail. Washing out the stomach is a palliative measure.

INTESTINAL OBSTRUCTION.

Cases of obstruction of the bowels may be roughly classified as **acute** and **chronic.** In childhood, the usual causes of **acute obstruction** are intussusception, internal strangulation by bands resulting from previous simple or tubercular peritonitis or by a Meckel's diverticulum, strangulated hernia, volvulus, impaction of foreign bodies, and appendicitis and perityphlitic inflammations generally. Acute obstruction may also supervene in the course of chronic obstruction, and, in the case of newly-born infants, may be due to malformation of the bowel. **Chronic obstruction** is very common and, in a large proportion of cases, is due to previous abdominal tuberculosis. Thus, it may be caused by adhesions between loops of bowel, by the constriction produced by the cicatrices of tubercular ulcers, by the traction of cicatrising tubercular glands, as well as by direct pressure exerted by enlarged glands. Chronic obstruction may also follow simple peritonitis; it may result from the presence of a tumour, and also occurs in the form of chronic intussusception. In cases of chronic obstruction the symptoms are very likely to become suddenly more acute; hence, in all cases of acute obstruction we enquire carefully into the past history of the patient.

The **symptoms** of obstruction are practically the same as in the adult, and the treatment must be carried out on similar lines. Here we would only add that, in children with pale, thin faces and ill-nourished bodies, who suffer from abdominal distension and periodic attacks of constipation and diarrhœa, or from borborygmi and occasional vomiting, chronic obstruction must be thought of. If, in addition, we can detect marked peristaltic movements of the intestines, and can make out, by the gurgling, that the intestinal contents are delayed at one particular point, the diagnosis is fairly certain.

INTUSSUSCEPTION.

Etiology.—Fully three-fourths of all the cases of intussusception seen in children occur during the first two years of life, and about one-half between the fourth and ninth months. Males are more frequently affected than females, and general weakness predisposes to the onset of the condition. Diarrhœal diseases, and the presence of intestinal irritants, have some causative action, and the condition is also rendered more liable to occur by the comparatively large size of the colon.

The **symptoms** usually come on quite suddenly; there is excessive pain—shown by crying and writhing—and the pain is distinctly paroxysmal. It is accompanied by vomiting, which is severe, frequent, and forcible—liquids taken by the mouth being almost immediately rejected. As time goes on the vomiting may become fæcal, but this is not invariable. Diarrhœa is an important and characteristic symptom. The stools are at first thin and feculent; later, only blood and mucus are passed. After some time, as the intussusception approaches the anus, there is great tenesmus. These symptoms are usually accompanied by marked collapse; the temperature is below normal, and the extremities cold. As the disease progresses, the pain, vomiting, and diarrhœa continue; there is slight tympanites, and the urine may be suppressed.

The most characteristic sign is the detection of the intussusception by palpation; it is felt as a tender, sausage-shaped mass, most commonly on the left side of the abdomen. In the earlier stages, however, it may be found in the region of the ascending or transverse colon. On examination by the rectum the intussusception can often be detected, as a mass somewhat resembling the os uteri in consistence and outline. In extreme cases the intussuscepted bowel may protrude at the anus.

When the disease is chronic the symptoms are less characteristic; the pain and vomiting occur at longer intervals; fæcal stools may alternate with mucous or muco-sanious motions; and a tumour of gradually changing position may be felt.

Course.—In a few cases natural resolution occurs, but in most the condition advances, and the invaginated part of the bowel becomes gangrenous and sloughs. In this way a cure has been known to occur, but the patient seldom lives long enough for separation to be complete, and even should he do so, the adhesions between the entering and ensheathing layers of bowel often yield, and a septic peritonitis is set up. In chronic cases gangrene is less likely to take place.

Morbid Anatomy.—The commonest position is at the ileo-colic valve; in most cases the ileo-cæcal variety of intussusception occurs; occasionally, we find ileo-colic or other types.

Diagnosis.—In the early stages the condition is apt to be mistaken for intestinal colic or acute gastro-enteritis. The acute onset, the pain, the vomiting, and the diarrhœa might all be so accounted for. However, in gastro-enteritis the temperature is raised, which is not the case in the early stages of intussusception. In the latter, too, the stools soon become characteristic, though an acute ileo-colitis may lead to a somewhat similar discharge from the bowels. The distinguishing feature of intussusception, however, is the tumour; a scybalous mass, the only thing likely to be mistaken for it, is less tender, yields on pressure, and is usually situated on the left side. The disease is distinguishable from appendicitis by the initial absence of fever, by the characteristic stools, and by careful palpation of the abdomen. In appendicitis the vomiting is often fæcal, there is usually constipation, and the tumour is felt in the right iliac fossa.

The **prognosis** is far from good; at least 60 per cent. of cases die.

Treatment.—As soon as an intussusception is diagnosed active treatment is needed. Opium ought at once to be given to allay the sensitiveness of the bowel and to control peristalsis. It is well to combine it with belladonna, and it may be given by the bowel or hypodermically. The patient should then be anæsthetised and an attempt made to reduce the intussusception by distending the bowel with air or fluid. The child is placed with the buttocks somewhat raised, and the exact position of the tumour then determined. In inflation a rectal tube is passed; it should be surrounded with a plug of gauze or a bandage to prevent the air returning by the rectum. For a similar reason the buttocks should be firmly pressed together. Air is then gently driven in; an ordinary hand-bellows or cycle pump will serve admirably. The amount of air introduced must be gauged by the degree of abdominal distension resulting; and with anything like ordinary prudence the risk of injury to the bowel is infinitesimal. Instead of air some prefer to use carbonic acid gas. Injections may be tried should inflation fail; or they may replace the latter entirely, salt solution or water being used, though warmed oil is probably better. The fluid may be gently injected by an ordinary enema syringe, or preferably—as giving a more equable pressure—by allowing it to flow from a douche can raised above the bed. In this case a height of 6 ft. should never be exceeded; and probably 4 or 5 ft. is quite sufficient, and as much as is compatible with safety. Usually about a quart of fluid requires to be injected. Not more than two attempts should be made to reduce an intussusception by injection. If the swelling disappear under this treatment we watch carefully for any return of pain and vomiting; should the symptoms recur we may proceed as before, or have recourse to laparotomy. Should distension of the bowel with air or fluid fail in the first instance, no time should be lost in having the abdomen opened.

When the intussusception has been remedied either by distension of the gut or operation, the patient must be kept at absolute rest for some little time. To ensure this, opium should be given, all food by the mouth stopped, and only ice or hot water given to allay thirst. The diet must be carefully regulated for some time afterwards.

CONSTIPATION.

Though common in childhood, constipation is scarcely so frequent as in later life; for, although the anatomical conditions in the young would seem to favour it, habit, which is so important a factor in its production in the adult, has not yet had time to develop.

Etiology.—If the bowels do not act within thirty-six hours of birth, we always suspect the presence of some malformation, particularly of the rectum or anus, and a local examination must be made. After the first few days of life constipation is usually due to faulty diet, though other factors at times come into play, as when we observe the condition in several members of a family. Constipation is more common in bottle-fed than in breast-fed children, and may be due to the food containing an excess of casein or being defective in fat or sugar. It is not infrequently due to an insufficient supply of water, particularly in children who perspire freely. In later childhood, the diet has also a considerable influence in the etiology of constipation; thus, food which leaves but little solid residue will tend to make the motions hard and infrequent.

There are, however, very many other causes.

The intestinal secretion may be defective, as in exhausting diseases with excessive perspiration, after the immoderate use of purgatives, or after diarrhœa from any cause. Again, the muscular power of the intestine may be defective, as in children leading a too sedentary life, or in rickets; or the constipation may be due to a nervous lesion, such as meningitis, hydrocephalus, &c.

There may be obstruction to the passage of fæces, either from something in the bowel itself, or from external pressure. In childhood, the small intestine is relatively long and narrow, and, while the ascending and transverse parts of the colon are short, the descending colon is long—sometimes so long that it is thrown into folds. In addition to this the pelvis is small, and these anatomical facts to some extent account for a few cases of constipation. Worms, the presence in the bowel of indigestible substances, polypi, and other conditions in the intestines; peritonitic bands, effusions, growths, and various other causes outside the bowel, may lead to more or less severe constipation.

The **symptoms** associated with constipation—itself a symptom, and not a disease—vary within wide limits. There may only be a little discomfort and perhaps headache, or there may be marked local and constitutional derangement. Thus, distension of the abdomen, flatulence, and pain from the accumulation in the bowel of gas, may all be present. Constipation may alternate with diarrhœa, which, moreover, is apt to disguise the presence of the former. In severe cases, piles, œdema of the feet, and distension of the superficial abdominal veins may occur. Headache, dyspepsia with bad taste in the mouth, foul breath, and pallor are common symptoms.

In young infants there are usually fretfulness, crying, drawing up of the legs, and other signs of abdominal discomfort.

The **prognosis** depends on the cause of the constipation. Unless due to some organic cause, it is favourable.

The **treatment** varies with the condition present in each case. Where there is obstruction or some congenital defect, this must be attended to; when constipation is merely a symptom of some more serious disease, the constitutional condition calls for treatment.

In simple constipation, suitable dieting is of primary importance. In bottle-fed children, a reduction in the quantity of milk, with some increase in the sugar and perhaps in the fats, will usually relieve the condition. At the same time fluid magnesia, or oatmeal water, may be given along with the milk, and we must see that the patient has a drink of water occasionally. In the case of children at the breast, the diet of the mother should be altered so as to contain less nitrogenous material and more salts; it is well also to see that, in the case of the mother, the bowels act regularly.

In older children the amount of starch in the diet must be limited, and articles leaving a considerable residue—fruit, oatmeal porridge, brown bread, &c.—should be added to the food. Plenty of outdoor exercise must be insisted upon. As regards drugs, magnesia, rhubarb in small doses, liquorice, and cascara, are among the best; the smallest dose which will produce regular motions should be used. As purgatives for occasional use, castor oil and calomel are suitable. Belladonna, aloes, and nux vomica, are beneficial in some cases. In young infants the daily use of soap or glycerine suppositories is sometimes to be preferred to constant medication of the mouth; hot water enemata are also effectual.

One of the most important therapeutic measures in the constipation of children is massage of the abdomen—especially along the line of the colon—for several minutes every day. In many cases general tonics are indicated.

IDIOPATHIC DILATATION OF THE COLON.

Under this name have been described cases of great distension of the colon with hypertrophy of the muscular wall, and frequently ulceration of the mucous membrane, but without any evident cause for these changes. The condition may be found soon after birth, or somewhat later; it is associated with marked constipation and distension of the abdomen.

Treves has suggested that all such cases are secondary to some chronic obstruction in the bowel below, especially to an imperfectly-developed rectum or anus. According to this view the condition would be an example of the dilatation and hypertrophy of the bowel, so commonly found above an obstruction at any position in the alimentary canal.

The **prognosis** is not good; a fairly large proportion of the cases have gradually emaciated and died; some have lived to adult life with the bowel in the same condition. As regards **treatment,** enemata, massage, electricity, and such drugs as strychnine and aloes, are probably the best means to employ in this condition.

PROLAPSE OF THE RECTUM.

Of this there are two varieties:—(1) a simple protrusion of the mucous membrane, and (2) a true invagination of the rectum.

Etiology.—Prolapse of the rectum is common in children, partly on account of the weakness of the supporting muscles, and partly on account of the loose attachments of the structure, its more vertical position, and the slight concavity of the sacrum and coccyx in childhood. Prolapse frequently follows diarrhœa, especially when along with congestion of the rectal mucous membrane there has been a disappearance of fat from the perineum. The condition may also be caused by constipation, as well as by anything which leads to excessive straining—thread worms, stone, phimosis, &c.

Symptoms.—At first, prolapse occurs only during defæcation, and the gut is readily returned by pressure or goes back spontaneously. It may only occur once or twice, but usually returns again and again. After a time the mucous membrane becomes congested and ulcerated, prolapse tends to occur with crying or straining, quite apart from defæcation, and the prolapsed bowel is difficult to reduce. The dark red or purplish swelling, with the central opening, protruding from the anus, is quite characteristic; unless there is great congestion it is not usually tender. The skin in the immediate neighbourhood is often irritated.

Treatment.—In most cases the prolapse can be readily returned by the mother, and in ordinary slight cases all that is needed is to direct her to do so after sponging the part with cold water; this, with some simple remedy to check the diarrhœa, is usually sufficient. In worse cases the child should lie on its face; after the prolapsed gut has been replaced by the carefully oiled hand, a starch and opium enema is given and a T-bandage applied. If the child strain excessively, chloroform is needed. When once reduced the prolapse may not recur; usually, however, there is a great tendency to its return. We diminish straining at stool by regulating the bowels, and by making the child defæcate while lying on the side, or at least with the feet removed from the ground. Astringent enemata may be used to prevent recurrence; hypodermic injections of strychnine ($\frac{1}{150}$ to $\frac{1}{100}$ gr.) or of ergotin ($\frac{1}{3}$ to $\frac{1}{2}$ gr.) into the tissues of the perineum are also of use. Nux vomica may be given by the mouth. If these means fail, the application of nitric acid or the actual cautery to the prolapsed mucous membrane may prove curative.

POLYPUS OF THE RECTUM.

This is a rare condition; it is most commonly seen between the third and the twelfth year, and is scarcely ever met with before the second year. The size of the polypus varies from that of a pea to that of a cherry or larger. It may be single or multiple, and is usually situated from 1 to 1½ ins. above the sphincter. The colour is bright-red or purplish, and the growths are usually pedunculated. The structure is that of an adenoma.

Symptoms.—There is usually tenesmus, with the discharge of blood-stained mucus. The blood is not mixed with the stools but lies on the top, and may be bright-red or clotted. The polypus is protruded during defæcation, only to return with the completion of the act. In order to assure the diagnosis the polypus may be brought down by getting the child to strain over a chamber-pot, or by the administration of an enema. Should these means fail the finger is swept round the rectal wall, a proceeding by which the pedicle can generally be detected.

The **diagnosis** is easy. Hæmorrhoids are rare in childhood, and the central aperture in cases of prolapse prevents any difficulty arising.

Treatment.—The polypus must be pulled down and the pedicle snipped through with scissors. It may be ligatured before division, but this is not essential. In pulling down the growth, forcible traction must be avoided lest a prolapse of the rectum be brought about.

Fissure of the anus is far from infrequent in children, but, as a rule, the ulcer is small. The symptoms are the same as in the adult, but in the child an ulcer here is apt to set up reflex disturbances—dysuria, incontinence, &c. In the **treatment**, nitrate of silver, applied to the edges of the ulcer, is often sufficient. Forcible dilatation or incision may be required.

Proctitis is not uncommon. It may be due to the passage of scybali, the presence of thread worms, foreign bodies, &c. There is tenesmus, frequent defæcation, the passage of mucus, and, in very acute cases, hæmorrhage. The treatment consists of the administration of gentle laxatives and local sedatives—starch and opium injections, belladonna, cocaine, or morphia suppositories, &c.

Syphilitic ulceration, fistula, and **ischio-rectal abscess** are rare in childhood.

MALFORMATIONS OF THE INTESTINES.

Many abnormalities of the intestinal canal have been described. Some of these are of comparatively little importance to the child, some are necessarily fatal within a day or two of birth, others prove fatal unless relieved by operative measures.

Malformations of the small intestine are much less frequent than those of the large. The chief are—(1) Obliteration or imperfect development at some part; and (2) persistence of Meckel's diverticulum. Congenital occlusion of the gut is usually found in the upper part, especially in the duodenum where it becomes continuous with the jejunum, or where the biliary and pancreatic ducts enter. Any part of the small intestine may, however, be occluded. Fœtal peritonitis appears to play an important part in the production of these abnormalities. Meckel's diverticulum arises from the ileum about 1 to 3 ft. above the ileo-cæcal valve; it may only be 1 or 2 ins. long and hang free in the peritoneal cavity, it may be attached by a fibrous cord (the representative of the obliterated portion of the duct) to the umbilicus, or it may open freely to the navel and lead to the formation of a congenital fæcal fistula. Prolapse of the mucous membrane lining it gives rise to one form of so-called polypus of the umbilicus. The persistence of Meckel's diverticulum may lead to internal strangulation.

Malformations of the Large Intestine, especially such as affect the rectum and anus, are more common than the preceding. The whole of the larger bowel may be absent, or may be wholly or partly represented by a tube no thicker than a quill.

The following are the chief malformations of the rectum and anus:—(1) Narrowing of rectum or anus, without occlusion. (2) Complete occlusion of the anus by a membranous diaphragm, or well-formed skin. (3) Absence of the anus, while the rectum ends as a blind pouch at a point more or less distant from the perineum. (4) The anus is normal in appearance, but ends as a *cul de sac* at a variable distance from its orifice. (5) Anus absent, the rectum ends in vagina, bladder, or urethra. (6) Anus absent, the rectum ends in a fistula in region of sacrum or perineum. (7) Anus and rectum are normal, but the ureter, vagina, or urethra opens into rectal cavity. (8) Total absence of rectum. (*Bodenhamer* quoted by *Wharton.*)

Symptoms and Diagnosis.—In nearly all these conditions the symptoms are those of obstruction of the bowel, coming on soon after birth. In all cases where thirty-six hours have elapsed without the passage of a motion, particularly if vomiting be added, a local examination must be made. The higher up the obstruction the sooner does vomiting set in, and the less is the abdominal distension.

The **prognosis** depends on the exact condition present. When the occlusion is high up, a favourable result cannot be expected. In those lower down, surgical treatment may be of avail in saving the patient's life.

ABDOMINAL TUBERCULOSIS.

Pathology and Morbid Anatomy.—Like all other cavities of the body the abdomen is exposed to the inroads of the bacillus of tubercle. The organism may gain entrance (1) by the blood stream, being conveyed from a focus in another part of the body; (2) by the intestine, as in cases where phthisical sputum, or infected food—in particular milk—is swallowed; (3) by spread from adjacent structures, such as the pleura or female generative organs.

Of these sources of infection the blood stream, the swallowing of tubercular sputum, and the spread from a tubercular pleurisy, are seemingly the most common. It is probable that the danger arising from the use of milk from a tuberculous animal has been somewhat exaggerated. Though, in many instances, the milk drawn from a diseased udder contains the tubercle bacillus, it is not probable that it does so when the tubercle affects distant organs, but spares the udder. Similarly, the milk of a phthisical woman has been shown to be free from the germs of the disease.

From the triple possibility of infection the abdominal lesions are manifold, and their clinical phenomena at times perplexing. Taking first, infection by the blood stream; it is possible that a **miliary tuberculosis of the peritoneum** may be set up. This may occur as part of a general acute tuberculosis, and be masked by the more general features of the disease, or, as happens in some instances, the peritoneum may be specially selected, with the result that symptoms, so acute as in some cases to resemble those of a perforative peritonitis, are produced. The peritoneum is studded with small grey miliary tubercles, the bowels are matted by recent lymph, and the fluid exudation is scanty. If the process be less acute, the lesion found is a deposit of somewhat large yellow miliary tubercles, with copious exudation of fluid—the **ascitic form of chronic tubercular peritonitis**. In these cases there is often a tubercular pleurisy, with effusion on one or both sides. A still more chronic inflammation may result; the bowels are closely matted by fibrous tissue, in the midst of which caseating masses are found. These may break down and give rise to abscesses, which rupture to the skin (often in the umbilical region) or into the bowel. Loculated collections of fluid are sometimes found in this condition, and the caseating masses may calcify. In this, **the fibro-caseous form of tubercular peritonitis**, secondary ulceration of the bowel, and enlargement of the mesenteric glands are common. Lastly, in the most chronic form of all, the tubercular inflammation results only in the matting together of the intestines by dense bands of fibrous tissue, without any exudation of fluid or caseation taking place. To this the name of **chronic fibrous tubercular peritonitis** is given. Infection of the abdomen, by spread from neighbouring organs, gives rise to very similar processes, but, in this case, only the less acute forms will, as a rule, result.

When the germs gain entrance by the bowel the first lesion produced is usually swelling and ulceration of the follicles. Tubercular ulcers are arranged transversely to the long axis of the bowel, their edges overhang, their bases are irregular, and the corresponding peritoneal surface is studded with miliary tubercles. The infection spreads through the lymphatics, causing them to assume the appearance of white beaded lines, and reaches the mesenteric glands, where it gives rise to enlargement and caseation, and ultimately to suppuration or calcification. In some cases the organism passes from the bowel to the glands without producing any recognisable lesion in the former.

The above picture of the morbid anatomy and pathology of abdominal tuberculosis is perhaps somewhat diagrammatic. It will serve, however, to indicate that tubercular peritonitis is most frequently due to infection through the medium of the blood stream, whilst ulceration of the bowels and tabes mesenterica are usually due to infection from the intestinal contents. Whilst the latter, however, may result secondarily from peritonitis, the converse (a peritonitis consequent on glandular affection) is probably of somewhat rare occurrence. At the same time it is evident that in any case more than one source of infection may be present; for example, tuberculosis of the bronchial glands may lead to phthisis with subsequent infection of the bowel from the swallowed sputum; to pleurisy, with extension to the peritoneum through the diaphragm; to miliary tuberculosis; or to all of these processes combined.

TUBERCULAR ULCERATION OF THE INTESTINE.

The **symptoms** of this condition are often vague, and ulcers are not infrequently found on *post-mortem* examination, although no symptoms were present during life. At other times there is chronic diarrhœa, with or without an excess of mucus, and perhaps spotted with blood; only rarely does much blood pass. There is usually some meteorism, and, occasionally, localised tenderness on pressure over some point in the abdomen. The child's health suffers seriously, and there is an irregular temperature.

Diagnosis.—When a diarrhœa, in spite of treatment, remains chronic for three weeks, one should suspect the presence of ulceration of the bowel. In the large majority of cases the ulceration is of the simple follicular variety, but it may be tubercular or typhoid. In the latter case there are other distinctive signs, whilst a tubercular ulcer is suggested by a gradual onset, by irregular temperature, by signs of tubercular disease elsewhere, by enlarged mesenteric glands, and by a tubercular family history; a diagnosis can, however, only be definitely made when tubercle bacilli are found in the stools—not an easy thing.

The **prognosis** is bad, and the **treatment** is largely palliative. Careful dieting, as in chronic gastric catarrh, is indicated, along with the use of bismuth, benzo-naphthol, naphthalene, or other intestinal antiseptic, and constitutional treatment by cod-liver oil, hypophosphites, &c.

Tabes Mesenterica.

Tubercular disease of the mesenteric glands is frequent in children dying of tuberculosis, but in only a small proportion of the cases is the tabes the initial or important part of the disease. In most cases the affection of the glands follows the absorption of tubercle bacilli from the bowel. As a rule, there is a primary lesion of the bowel, but, as already stated, bacilli can evidently pass to the glands without any visible affection of the intestinal mucous membrane. The term tabes mesenterica should be applied only to such cases as have the enlargement of the abdominal glands as their prominent feature. Thus, neither to cases of phthisis, in which large mesenteric glands can be detected late in the disease, nor to cases of tubercular peritonitis complicated by glandular enlargement should the name be given.

Symptoms.—The symptoms are practically the same as those of many other chronic abdominal diseases—viz., emaciated and sallow complexion, voracious appetite, diarrhœa, at times with the appearance of fat in the stools, slight pain, perhaps, or none at all. The abdomen is distended, the abdominal veins may also be engorged, and the glands of the groin may be enlarged. The only distinctive feature is the presence of the enlarged glands, which should be sought for by palpating deeply with a hand on each side of the abdomen. If the abdominal wall is resistant the child should be anæsthetised. It must be confessed, however, that enlarged mesenteric glands are often present when, even on the most careful examination, they cannot be felt. Unless the nodules feel as if deeply situated in the abdomen, the condition is probably not tabes mesenterica; superficial swellings are generally due to tubercular peritonitis. The latter, however, is often complicated by enlarged mesenteric glands.

Occasionally, there are symptoms resulting from the pressure exerted by the enlarged glands; of these the most important are intestinal obstruction, ascites, œdema of the legs, and hydronephrosis.

Prognosis.—As a rule, the prognosis is not good, but sometimes cases recover by resolution of the glands. Suppuration of the glands may occur, and these may burst, usually into the bowel or into the peritoneum; this may be followed by recovery, but, as a rule, the result is fatal. The duration of the disease is very variable.

Treatment.—Attention should be paid to the condition of the bowel, from which, in the large majority of cases, the disease is derived. Thus, in cases of chronic diarrhœa, there is set up—probably as the result of the long-standing irritation—some simple enlargement of the glands before tubercular infection of the latter occurs. In diarrhœas of some duration, therefore, Jacobi recommends the use of iodide of sodium, and afterwards of iodide of iron, to reduce this simple enlargement and so lessen the risk of tubercular infection. When the condition has appeared, the treatment is largely constitutional.

TUBERCULAR PERITONITIS.

This is by far the most important form of abdominal tuberculosis. It may be acute or chronic.

Acute tubercular peritonitis may occur in general miliary tuberculosis, without any symptoms specially pointing to the abdomen. Occasionally, cases of acute tuberculosis of the peritoneum are found closely resembling those of acute non-tubercular peritonitis.

Chronic tubercular peritonitis is a common disease of childhood. It is rarely found, however, before the third year, and the great majority of the cases occur between the ages of six and twelve years. The cases are pretty equally divided as regards sex. Three varieties of the disease are now generally recognised—viz., (1) The **ascitic**; (2) the **fibro-caseous**; and (3) the **fibrous** or **fibro-adhesive.**

(1) CHRONIC TUBERCULAR ASCITES.

This is not infrequently the first stage of any of the varieties. The disease usually commences with some rise of temperature, nausea, vomiting, and diarrhœa, accompanied by signs of abdominal distension. Later, however, the feverish symptoms often disappear, leaving merely the abdominal distension, perhaps some meteorism, and diarrhœa with liquid stools alternating with constipation. One finds the usual signs of a free ascites—dulness altering in position with change of posture, fluctuation, &c.—and along with these there are, not infrequently, signs of effusion at the base of one or both pleuræ, particularly the left. The appetite is poor, the body is somewhat thin, and looks thinner from the large size of the abdomen, but in some cases the nutrition of the body remains remarkably good.

The disease is of indefinite duration, and may result in direct recovery (sometimes within a few weeks) or in a spread of the tubercular process, a course which is often preceded by the appearance of the fibro-caseous variety of the disease.

Diagnosis.—Acute peritonitis with effusion, and general diseases—*e.g.*, affections of the heart or kidneys—leading to ascites are readily distinguished from tubercular ascites. Cirrhosis of the liver is much more difficult to eliminate; fever and diarrhœa point to tubercular peritonitis; a large and hard liver (for most cirrhoses in children are hypertrophic), enlarged spleen, and venous rosary round the umbilicus are in favour of cirrhosis of the liver, though they are by no means distinctive. Tapping the abdomen, and the examination of the fluid for tubercle bacilli, or (what is more valuable) the effects of its injection into guinea-pigs will usually settle the question. In rare instances, tubercular glands at the fissure of the liver may give rise to ascites, as may also cysts of the omentum, sarcoma of the kidney, &c.

(2) Fibro-caseous Tubercular Peritonitis.

This is the ordinary form of tubercular peritonitis, in which the abdomen is distended and unequally resistant. Hard masses of various sizes may be felt, many of them in the form of cakes; they are usually more superficial than the masses in tabes mesenterica. It must, however, be remembered that secondary enlargement of the mesenteric glands is very frequently present in tubercular peritonitis. There is, as a rule, little tenderness on palpation, though occasionally it is great. Not infrequently the infiltrated omentum may be felt as a thickened band reaching across the abdomen from one hypochondriac region to the other. The masses are often associated with localised collections of fluid, and become much more evident if the fluid be withdrawn.

There are usually marked constitutional symptoms; the child gets thin and pale, there is more or less fever, the skin becomes harsh and dry, and some pigmentation may occur about the face or other parts of the body. Sweating is frequent, the limbs are thin and small—looking all the more so because of the large size of the abdomen—and œdema of the legs is apt to supervene. The appetite is poor, there is frequently nausea, and sometimes vomiting, whilst diarrhœa is often present. Borborygmi may be heard when the abdomen is palpated, or may occur spontaneously, and there are sometimes spasmodic pains in the bowels.

Course and Prognosis.—In some cases recovery gradually comes about, but much more frequently extension of the disease occurs. The duration of the condition varies very greatly; thus, in some cases general tuberculosis may be early set up, whilst in others it only follows after a considerable period. Tubercular ulcers of the bowel are frequently associated with this form of peritonitis, and enlargement of the mesenteric glands is common. Abscesses sometimes form round the bowel; these may discharge into the intestine or open on the skin surface. When the latter occurs, it usually takes place near the umbilicus; a red, inflamed swelling appears and bursts, leading to a fæcal fistula. Interference with the lumen of the bowel is not uncommon, so that intestinal obstruction, to a greater or less degree, is often due to this form of peritonitis.

The **diagnosis** is not, as a rule, difficult. Enlarged mesenteric glands without tubercular peritonitis are comparatively rare; they are deep, and are seldom of great size. Retroperitoneal sarcoma is occasionally difficult to diagnose from fibro-caseous peritonitis: the fever, family history, and appearance of tubercle elsewhere may, however, render the diagnosis certain. Tubercular peritonitis is also, of course, much more common than sarcoma. An infiltrated and thickened omentum may somewhat closely resemble an enlarged liver and spleen, but careful palpation and percussion ought always to distinguish them.

(3) FIBROUS OR FIBRO-ADHESIVE TUBERCULAR PERITONITIS.

In this form the tubercular disease is in process of cure.

Symptoms.—There may be no symptoms pointing to the condition, the disease being found *post-mortem* where its presence was never suspected. In other cases there are signs of interference with the gastro-intestinal functions; thus, nausea, vomiting, constipation, attacks of diarrhœa, &c., may be produced, and along with these there are general signs of wasting. The abdomen may be prominent from the distension of some coils of intestine, or it may be retracted from binding down of the bowel and the atrophy which is apt to ensue. Constitutional symptoms may be absent, or there may be fever, sweating, &c., from tubercular disease elsewhere. Signs of obstruction of the bowel sometimes occur, and, occasionally, œdema from compression of intra-abdominal veins. On palpation firm cords with sinuous outlines may be felt, and a transverse one may represent the shrunken and fibrous omentum.

The course is very variable. The chief dangers, so far as the actual lesion in the abdomen is concerned, are intestinal obstruction, and gradual wasting from interference with the functions of the alimentary canal.

TREATMENT OF TUBERCULAR PERITONITIS.

The great point which the physician should keep before him in the treatment of tubercular peritonitis is the curability of the condition.

In cases of acute tubercular peritonitis, besides the treatment of the acute general tuberculosis, which is essentially symptomatic, the abdominal symptoms may be treated by ice to the abdomen, opium to give rest, and a light fluid diet.

In chronic tubercular peritonitis great care must be given to the diet, which should consist of easily digested, chiefly fluid food, so as to leave a minimum of residue to be eliminated. Fresh air is of great value, and the child should, if at all possible, be taken out into the open every day; a stay in the country is advisable.

Cod-liver oil, creasote, guaiacol, and the phosphates and hypophosphites are useful here as in tubercle elsewhere. In cases where there is some fever, the inunction of guaiacol in oil (10 minims or more in about ten times that quantity of oil) may prove of value, both from the action of the guaiacol on the tubercular process, and from its antipyretic properties.

Counter-irritation to the abdomen is frequently beneficial—equal parts of the liniment and tincture of iodine, or small blisters frequently repeated. We have seen cases of fibro-caseous peritonitis, with large masses, completely recover under the latter remedy, combined with constitutional treatment. Painting with tincture of iodine followed by coating with collodion has been much extolled; the latter allows the iodine to act, and steadies the abdominal wall, but the contraction of the collodion is sometimes very painful. The inunction of mercury in some form is much in use.

In some cases of tubercular peritonitis surgical treatment is of prime importance. The cases in which it is of greatest value belong to the ascitic form of the disease. Either simple incision, with evacuation of the fluid from the abdominal cavity, and immediate stitching of the wound, may be performed, or, after incision, a drainage tube may be left in for some days. The results are, in a large number of cases, marvellously successful. Simple tapping is, however, of little value, and evidently the point of importance is to open the abdominal wall. Of the other forms of the disease, the only ones in which surgical interference is at all likely to give good results are those with localised collections of fluid, which may heal after drainage. The typical fibro-caseous peritonitis does not lend itself to operative interference.

AFFECTIONS OF THE PERITONEUM.

ACUTE PERITONITIS

is fairly common in children. In the newly-born it is frequently present in cases of septic infection through the umbilical wound.

In older children it may occur in scarlet fever, pneumonia, and other infectious diseases; otherwise its causes are much the same as in adults, the commonest being extension to the peritoneum of inflammation of one of the abdominal organs, or of neighbouring parts, such as the pleura.

CHRONIC NON-TUBERCULAR PERITONITIS

is extremely rare compared with the chronic tubercular form of the disease. It may occur in fœtal life, probably as the result of syphilis; in childhood it may follow acute peritonitis, or succeed an injury, or an acute illness, such as measles.

The **symptoms** are much the same as in tubercular peritonitis, but a marked rise of temperature, the presence of distinct nodules, a tubercular family history, and signs of tubercle elsewhere, point to the condition being tubercular. The child may gradually recover, or recovery may only come about after several relapses, or, finally, the patient may gradually sink.

The **treatment** is practically the same as in tubercular peritonitis.

TUMOURS OF THE PERITONEUM

are rare. Cysts are sometimes found; carcinomata and sarcomata are extremely uncommon. Colloid cancer of the omentum is occasionally met with, and cysts, simple or hydatid, may occur.

ASCITES.

Of the causes of ascites in childhood the following may be mentioned:—Tubercular peritonitis, cirrhosis of the liver, growths (especially enlarged glands) pressing on the portal vein, cardiac disease, renal diseases, various forms of anæmia, and growths of various kinds inside the abdomen. Of these, tubercular peritonitis, cirrhosis of the liver, and general diseases are the only ones at all common. The **symptoms** are the same as in the adult, and the **treatment** depends on the cause.

INTESTINAL WORMS.

By the laity worms are credited with giving rise to many symptoms, picking at the nose, excessive appetite with want of corresponding growth on the part of the child, pallor, and nervous symptoms generally, all being ascribed to these parasites. It must, however, be accepted as a constant rule that worms should never be diagnosed until they have been seen. In many cases round or tapeworms are present without giving rise to any symptoms whatever; but, on the other hand, nervous symptoms are occasionally caused by the presence of these parasites, and disappear after their expulsion. The chief varieties of worms found in children are three in number.

(1) THREAD-WORMS.

The *Oxyuris vermicularis*, as is well known, inhabits chiefly the lower part of the colon and the rectum, but may also be present in the cæcum and lower part of the small intestine.

Symptoms.—The chief symptom is irritation about the anus; this is most marked in the evening, and is produced by the worms moving about the anal aperture. The child, after being in bed for some time, gets fretful, and the irritation may actually become painful. Occasionally the symptoms may also be present through the day. In addition there is often a tendency to mucous discharge, and to consequent irritation of the skin round the anus. Sometimes, in girls, the worms pass into the vulva, and give rise to vulvo-vaginitis with leucorrhœa. Nervous symptoms at night, including grinding of the teeth, disturbances of sleep, twitchings, &c., may result from the presence of worms, and incontinence of urine may have a similar origin.

The **treatment** should be carried out in two directions—(1) locally, and (2) by the mouth. To remove the worms locally large enemata should be used, and it is well to use an enema-syringe with a long soft tube which passes well up into the rectum. A simple soap and water enema is often effectual, but, as a rule, it is better to use something more toxic to the parasites; salt solution and infusion of quassia are favourite injections. To prevent irritation at the anus the application of a weak mercurial ointment is useful. Vulvo-vaginitis resulting from thread-worms should be treated by injections and the use of a mercurial ointment.

Internal medication is of great importance in many cases. The best drugs to use are either such as are not readily soluble in the alimentary canal—*e.g.*, calomel and naphthalene, or those which produce large watery motions, and so carry away the worms—*e.g.*, strong salines. A dose of 2 or 3 grs. of naphthalene with 1 or 1½ grs. of calomel to a child of two or three years acts well; it should be repeated in a few days.

(2) ROUND WORMS.

The *Ascaris lumbricoides* has its habitat in the small intestine, especially in the upper part, but it may wander from this situation. Thus it frequently finds its way out at the anus; it may pass into the stomach and be vomited; may get into the larynx, and even give rise to a fatal pneumonia; may obstruct the common bile duct and cause jaundice, or pass into the smaller bile ducts and lead to abscess of the liver; or it may find its way into the peritoneal cavity through an ulcer.

Symptoms.—As a rule, the presence of ascarides has not been suspected until one has been passed. Sometimes, however, there are reflex nervous symptoms, such as night terrors, twitchings, and perhaps even convulsions, whilst abdominal discomfort, flatulence, and colic may be experienced. Where large numbers of the parasite are present, they may become rolled into a ball and give rise to a swelling which can be palpated, or may even lead to intestinal obstruction, and cause death. But, as already said, there are generally no symptoms whatever from the presence of ascarides.

Treatment.—Where round worms have been passed, or where their presence is suspected, santonin is the drug which should be relied on. The child should be fed for a day or two on diet which leaves as little residue as possible; then santonin—1 or 2 grs. repeated twice or thrice at intervals of two or three hours—should be given, along with castor oil or some other purgative. This treatment may be repeated in some days should the presence of more worms be suspected. Immoderate doses of santonin must be avoided, as symptoms of poisoning, including yellow vision, giddiness, and general depression may result.

(3) TAPE-WORMS.

The commonest form of tape-worm in children is the *Tænia mediocanellata ;* the *Tænia solium* is rarely found, whilst in young infants the *Tænia cucumerina* is occasionally met with.

Symptoms.—As in the case of round worms, the presence of tape-worms is usually unsuspected till they appear in the stools. As a rule, a few segments only are passed at a time—unless purgatives have been given, when larger portions may appear. Bands of mucus may be mistaken for segments of tape-worm ; so until the physician has actually seen the segments, or has got a clear description from the mother, he must not conclude too rapidly that he has to deal with a tænia.

The usual reflex symptoms, including picking at the nose, twitchings, convulsions, &c., are frequently referred to tape-worms, and occasionally may actually be due to them. Excessive appetite, with emaciation, pallor, and hollow eyes, is popularly supposed, but without good reason, to be indicative of tape-worm.

Treatment.—The patient should be almost starved, or put on a very light diet, such as milk and soups, for a day or two ; then, in the evening, a purgative should be given to open the bowels. In the morning, when this has acted, fluid extract of male fern, 1 to 2 drs., either in a single dose, or in two doses with an hour or so between, should be administered, followed in two or three hours by a dose of castor oil. This is probably the most generally useful treatment, and succeeds well, as a rule. The head must be carefully sought for after beating up the fæces and washing frequently, care being taken not to break the worm any more than is necessary. Should the head not be found the treatment must be repeated in two or three days. When all the body, except the head, comes away, a period of about three months usually elapses before segments again appear in the stools.

Instead of male fern, kusso may be used in doses of 2 to 3 drs , given with coffee in two doses, at an interval of half an hour ; this also should be followed by castor oil. Kamala in somewhat similar doses, or decoction of pomegranate root may also be tried. Oil of turpentine, 3 to 4 drs., given in the morning on an empty stomach, and followed in an hour or two by castor oil, is sometimes effective when others fail.

CATARRHAL JAUNDICE.

This is a common disease in children after the age of three or four years. The **symptoms** closely resemble those of catarrhal jaundice in adults, including digestive disturbances, clay-coloured stools, bilious urine, and an icteric tinge in the conjunctivæ, mucous membranes, skin, &c. In children, however, it is sometimes seen in epidemic form, and several cases may occur in succession in one family. The enlargement of the liver is usually considerable. The **diagnosis** is, as a rule, not difficult, and the **treatment** similar to that in adults.

CIRRHOSIS OF THE LIVER.

Whilst of comparatively rare occurrence in the child, cirrhosis of the liver is met with in various forms. Of these, **syphilitic cirrhosis** is the commonest. In this condition the liver is considerably enlarged, and there are usually other signs of congenital syphilis. At times jaundice is present, and this may be very marked; when present, it usually appears soon after birth, but in the majority of cases of syphilitic cirrhosis it is absent.

The chief difficulties in the diagnosis, if jaundice be present, are idiopathic jaundice of the newly-born, septic jaundice, and congenital obliteration of the bile ducts.

Atrophic Cirrhosis nearly always results from the continued use of alcohol, which is not uncommonly given, amongst the ignorant classes, to weakly children for long periods at a time. The symptoms are practically the same as those in adults; especially gastric disturbances—and particularly vomiting—the presence of ascites, wasting, frequently hæmorrhages from the stomach or bowel, dirty complexion, &c. Occasionally, in the early stage of the disease, jaundice is present. When such symptoms as have just been described are observed, atrophic cirrhosis should be thought of, even though the possibility of alcohol having been taken is denied.

The chief disease from which it has to be diagnosed is tubercular peritonitis, and, as a rule, the following points serve to distinguish them:—The freer movement of the ascitic fluid in cirrhosis, the more marked enlargement of the spleen, the less doughy feel of the abdomen, the tendency to hæmorrhages, and (in the advanced stage) decrease in the size of the liver. Occasionally, however, a certain amount of cirrhosis of the liver may occur in tubercular peritonitis; in this case the process usually begins at the capsule and penetrates inwards.

Biliary Cirrhosis is, as in adults, a rare disease. The symptoms are the same, especially the chronic jaundice without ascites, great enlargement of the liver with some tenderness, and enlargement of the spleen.

Besides these there may be cirrhosis of the liver from malaria, and a certain amount of fibrous infiltration may occur in various cardiac diseases leading to congestion of the liver.

FATTY LIVER.

This is a common condition in children, particularly in those suffering from some form of tubercle, and in gastro-intestinal affections. It is, however, met with frequently enough in many other diseases, and sometimes when the child has been apparently quite healthy. There are no symptoms specially indicative of it; the liver is larger than normal and somewhat soft.

Waxy liver, abscess of the liver, and hydatids occur as in adults; tumours, especially carcinomata, are, of course, very rare.

CONGENITAL OBLITERATION OF THE BILE DUCTS.

This disease, which is far from common, consists in an obliteration of one or more of the biliary ducts in some part of their course. The position and extent of the obliteration vary; in some cases the common bile duct is affected, in others, the cystic or hepatic ducts; the obliteration may be slight in extent, or the greater part of the ducts may be represented merely by a fibrous cord, or, indeed, be altogether absent.

Etiology.—The cause of the condition is not definitely known. Sometimes more than one member of a family has been affected; boys are more liable than girls. In many cases there is, no doubt, some interference with the normal development of the parts; in other cases, the obliteration may be due to an inflammatory condition of the duct walls, particularly if from some error of development the lumen is smaller than normal. This inflammatory condition of the walls may (according to *Thomson*) be due to some intra-uterine change in the composition of the bile which converts it into a local irritant.

Symptoms.—The most important symptom of the disease is persistent jaundice. This may develop immediately after birth, or may appear only after a lapse of some days. The icteric tinge is usually very deep, and is associated with highly bilious urine, and with clay-coloured stools. The stools may be colourless from the first, but not infrequently one or two motions of normal meconium are passed before the pale stools appear. The urine usually becomes somewhat paler later in the disease. Gastric disturbances (particularly vomiting) usually supervene; and hæmorrhages from the umbilicus, under the skin, or from various mucous membranes, not uncommonly take place. The child may die within a week or two of birth, or, if spared the hæmorrhages, may live up to the third or even the eighth month. Death usually occurs with toxic symptoms, especially convulsions and coma.

Diagnosis.—This disease has to be differentiated chiefly from idiopathic icterus of the newly-born, from septic jaundice, and from congenital syphilis with jaundice. Idiopathic jaundice passes away in a few days, and is not associated with pale stools; in septic jaundice there is generally inflammation around the umbilicus or elsewhere; in congenital syphilis there are other signs of the disease.

The **prognosis** is quite hopeless, and **treatment** is of no avail.

GALL-STONES

are rare in childhood; a few cases have been recorded in newly-born infants. In them jaundice is present at, or soon after, birth, and the case proves so rapidly fatal as to make it probable that some other abnormal condition may be present. Thomson suggests that the other lesion may be the disease which gives rise to congenital narrowing and obliteration of the bile ducts.

CHAPTER XIII.

DISEASES OF THE HÆMOPOIETIC SYSTEM.

Contents.—**Diseases of the Blood**—Simple Anæmia—Chlorosis—Pernicious Anæmia—Leucocythæmia—Other Forms of Anæmia—**Diseases of the Spleen**—**Diseases of the Thymus.**

DISEASES OF THE BLOOD.

The characters of the blood in children have been mentioned in some detail in treating of Physiology. It will be remembered that the red corpuscles are most numerous at birth—5,500,000 to 6,000,000 per c.mm. being a normal figure—that the hæmoglobin is abundant, and the specific gravity in consequence high, while the leucocytes are relatively numerous, 10,000 to 12,000 per c.mm. being a fair average during the first years of life. The red corpuscles and hæmoglobin diminish steadily (except for a transient rise on the part of the former during the first day or two); the hæmoglobin descending to its minimum by the sixth month, the red corpuscles by the second year; both then gradually rise to the adult proportion.

It will be convenient at this point to explain the terminology used. We speak of normal red blood-corpuscles generically as **erythrocytes**, and, according to their size and shape, as **megalo-**, **micro-**, and **poikilocytes**; of nucleated red corpuscles as **erythroblasts**, if of the size of a normal corpuscle as **normoblasts**, if larger, smaller, or irregular in outline, as **megalo-**, **micro-**, and **poikiloblasts** respectively. For clinical purposes it is advisable to divide the leucocytes according to the characters of their nuclei, and according to the granulations of their cell body. Thus we have large and small uninuclear elements—lymphocytes, transitional cells with horse-shoe shaped or slightly indented nuclei, and multinuclear (or more correctly polymorphnuclear) leucocytes, whose nuclei are extremely irregular and branching. As regards the granules, Ehrlich's classification based on their affinities for acid, neutral, or basic aniline dyes, has been most widely accepted. Ehrlich divides the cells present in human blood into those bearing **eosinophile**, neutrophile, fine basophile, and coarse basophile granulations. It has been proved that the neutrophile granules have, like the eosinophile, an affinity for acid dyes, so that we may more correctly classify granulations into coarse and fine acidophile and coarse and fine basophile. Now, for the clinician the granulations of by far the greatest importance are the eosinophile or coarse acidophile, and the neutrophile or fine acidophile. The fine basophile granulation is of little interest ; the coarsely basophile cells are pathological, and (rarely) present in leucocythæmic blood. Both the finely and coarsely granular acidophile cells are usually multinuclear ; fine basophile granules occur in a few of the larger mononuclear leucocytes.

TABLE OF PERCENTAGES OF LEUCOCYTES AT DIFFERENT AGES.

		Birth.	1 Year.	Adult.
		per cent.	per cent.	per cent.
Lymphocytes	Small uninuclear. No granulation, ...	50-70	55	24-30
	Large uninuclear. A few fine basophile, ...	11		3-6
Transitional leucocytes. A few fine basophile, ...		...	7	...
Multinuclear leucocytes	Neutrophile, . . .	28-40	35	60-75
	or Eosinophile, . .	0·5-10	0·5-7	1-4

Under certain pathological, though as yet ill-defined, conditions, abnormal leucocytes may be present in the blood. The most important of these are **myelocytes**, also called marrow, or "mark" cells (*Markzellen*). Apparently more than one variety of cell is included under this term, but for the present purpose it will be sufficient to regard them as large mononuclear elements, whose nuclei, rounded or slightly indented, stain faintly with methylene blue ; and whose further characteristic is that they have either neutrophile or eosinophile granulations. As has just been stated, only multinuclear cells normally bear these granulations. We have already mentioned the coarsely granular basophile leucocyte. It is known as a "mast" cell, and were it not to point out its distinction from the myelocyte or "mark" cell, it would be hardly necessary to allude to it. It occurs chiefly in leucocythæmia, but, apart from being evidence of a pathological condition of the blood, its discovery has no significance.*

* For the study of the blood changes, stained films are necessary. The simplest stain, and, for practical purposes the only one really needed, is eosin and methylene blue. By this means the nuclei, the red corpuscles, the eosinophile, and neutrophile granules are all stained. For methods, as well as more selective modes of staining (the Ehrlich-Biondi triple stain, &c.) the reader is referred to special text-books.

Before passing to discuss the separate forms of anæmia of childhood, three peculiarities may be mentioned :—(1) Owing presumably to the fact that, at a comparatively recent date, nucleated red corpuscles were present as a normal constituent of the blood, these structures very readily re-appear under pathological conditions—*i.e.*, when any additional stress is placed upon the hæmopoietic organs. Hence erythroblasts are more common in the anæmias of infancy than in those of later life. (2) Leucocytosis is a frequent accompaniment of anæmia, as well as of many constitutional and local disorders not necessarily attended by anæmia. (3) The spleen and lymphatic glands are prone to become enlarged in various diseases, and this is perhaps most often noticed when anæmia is present.

In the present state of our knowledge an exact classification of the anæmias of infancy is impossible. They have been divided into those with, and those without, leucocytosis ; into those with, and those without, enlargement of the spleen ; and doubtless other systems have been adopted. We may provisionally consider them under the heads of **simple anæmia, chlorosis, pernicious anæmia, leucocythæmia,** and **anæmia with splenic enlargement.**

SIMPLE ANÆMIA.

This is a condition very commonly present in childhood ; it results from various causes, and at times appears to occur spontaneously. The causes may be looked upon as coming under two heads :—(1) Insufficient nourishment and bad hygienic surroundings ; and (2) exhausting diseases. Anæmia may be congenital in cases where the mother has endured privation or illness during her pregnancy, and in the subjects of hereditary syphilis. More often it is acquired during infancy if the food be insufficient, and if the hygienic surroundings in general be unsatisfactory. In later childhood it arises from somewhat similar causes, and also from overwork at school. In like manner, both in infancy and childhood, many diseases tend to bring it about. Of these may be mentioned rickets, gastro-intestinal disorder, infectious diseases, Bright's disease, chronic suppuration, syphilis, hæmorrhages, tuberculosis, and rheumatism.

The **signs** and **symptoms** of anæmia are much the same as in the adult. The skin and mucous membranes are pale, the hands and feet cold, and, as a rule, the children are ill-nourished. Headache is commonly complained of ; the patients are sleepy, languid, and easily become tired. The sleep is broken, the appetite is poor, and pica or craving for unnatural substances may occur. Venous bruits are sometimes audible, as also are functional cardiac murmurs ; but the latter at least are less frequently present than in the adult. In listening for them care must be taken to avoid the possibility of producing an artificial bruit by too firm pressure of the stethoscope. The symptoms otherwise are those ordinarily found in anæmia, *plus* those of the constitutional disease present.

Blood Changes.—The number of the red corpuscles, the percentage of hæmoglobin, and the specific gravity are lowered. The corpuscles may be altered in the usual manner, and irregularity of size and shape be present, but, as a rule, even in an extreme case of simple anæmia, there is little change in their appearance apart from the diminution in number. The lowered percentage of hæmoglobin is usually in proportion to the diminution of red corpuscles, but this is not invariable; a chlorotic condition of the blood (*i.e.*, one in which the percentage of hæmoglobin is low relatively to the number of red corpuscles) is comparatively frequent. In all simple anæmias a leucocytosis may occur. It is most likely to be found in the more serious cases.

The **diagnosis** of anæmia is easy. The important matter is to discover its cause. Where no constitutional or local disease can be found, and where the anæmia is severe and persistent, we must always be somewhat anxious lest a latent tuberculosis be present.

The **prognosis** depends on the severity of the blood change and on the etiology.

Treatment.—The patient should be removed from all unfavourable surroundings, kept from school, and, if possible, sent to the country. Of drugs, iron, cod-liver oil, and arsenic are the most beneficial. The food should have abundance of iron-containing substances added to it—the yolk of egg, red meat, green vegetables, &c.

CHLOROSIS.

By some pædiatrists, notably by Henoch, chlorosis is said to be common in childhood; by others it is regarded as very rare. This divergence of opinion is to be accounted for by a confusion in respect of the nomenclature of the conditions met with. In children anæmia is an every-day occurrence, and, as we have stated, an examination of the blood may reveal a low percentage of hæmoglobin as compared with the corpuscles; that is, a chlorotic condition of the blood may be found. But the disease chlorosis has such definite characters—is so constantly a disease of puberty, and of the female sex; has such a marked tendency to relapse, and in so large a number of cases occurs without any discoverable cause—that it seems impossible to make its diagnosis turn on the relative proportion of red corpuscles and hæmoglobin. And this is the view now generally held. For we know that when recovery from any anæmia is taking place, the corpuscles increase more rapidly than does the hæmoglobin; hence, at one period or another the chlorotic condition may be produced. Further, this relative poverty in hæmoglobin is present in at least one other form of anæmia as a fairly constant feature, we mean in splenic anæmia. For these reasons it appears preferable to avoid the term "chlorosis" as descriptive of simple, and apparently spontaneous, anæmia of childhood, and to restrict its use to the typical condition met with at puberty and adolescence.

PERNICIOUS ANÆMIA.

This form of anæmia is rare in childhood. It may develop spontaneously or may appear as a result of the conditions mentioned in dealing with the etiology of simple anæmia. The blood has the usual characters of the adult type of pernicious anæmia—marked diminution and alteration in the appearance of the erythrocytes, the presence of erythroblasts, and a relatively high percentage of hæmoglobin. On one point some prognostic stress may be laid. Some recent observations have suggested the possibility that an idea may be gained of the probable course of the case by estimating the number of leucocytes. When they, as well as the red corpuscles, are considerably diminished, there is (it is believed) a greater degree of disturbance of hæmopoiesis, or a greater amount of hæmolysis, than when they remain within normal limits. Considering the fact that all infantile anæmias are liable to be attended by leucocytosis, it seems probable that a diminution in the number of the white cells would, in pernicious anæmia, be of considerable value as regards the prognosis. In the diagnosis of pernicious anæmia in the child the same care must be taken to exclude other diseases as in the adult. Malignant disease, the most frequent source of fallacy, is, however, so rare as to be negligible.

LEUCOCYTHÆMIA.

This blood disorder also is of comparatively rare occurrence during the earlier years of life, but both the spleno-myelogenous and the lymphatic types have been described. They may occur in infants only a few weeks old, and have even been congenital. The anatomical changes and symptoms of leucocythæmia in the child differ in no respect from those in the adult; but the course of the disease is often more rapid. A relatively large proportion of the recorded cases of **acute leucocythæmia** have been in children. This variety has some peculiar features and is worthy of brief mention. It sets in suddenly with fever, ulceration about the mouth and other parts of the alimentary tract, with hæmorrhage from these ulcers as well as into the skin and viscera, and with purpuric and erythematous rashes. The glands are usually enlarged, but splenic enlargement may be absent. The patient dies of asthenia in from a few days to six or seven weeks. Some cases of acute leucocythæmia occur without these violent symptoms: there is simply rapidly progressive anæmia with the characteristic blood changes. Micro-organisms have been described in several instances, and there is a certain amount of evidence in support of the view that the disease is of an infectious nature. In the majority of cases the change in the blood is mainly confined to the mononuclear leucocytes, the multinuclear cells are relatively, and apparently also absolutely, diminished. With this there occurs marked oligocythæmia, but the number of the erythroblasts is surprisingly small. We have thus to do with a true lymphocythæmia, but, while this is believed to be the characteristic blood change, in some cases the features of the ordinary spleno-myelogenous leukæmia have been present.

OTHER FORMS OF ANÆMIA WITH ENLARGEMENT OF THE SPLEEN.

The occurrence of a considerable degree of anæmia along with marked hypertrophy of the spleen, quite apart from the existence of leucocythæmia, is a not uncommon event in young children. The subjects of the disease are usually between the sixth and twenty-fourth month. It is by no means easy to understand the nature of these cases; the blood change varies greatly in different instances, and it is very doubtful whether among them there exists anything entitled to the position of a true primary anæmia. The most extreme alteration in the blood occurs in the condition now generally known as "pseudoleukæmic anæmia." This must not be confused with pseudoleukæmia (Hodgkin's disease), a malady with which it does not seem to have anything in common.

ANÆMIA INFANTUM PSEUDOLEUKÆMICA.

Much doubt exists as to the nature of this disease; and from being at first regarded as a definite blood disorder, the tendency now is to look upon it as one of the secondary forms of anæmia. It was originally described by von Jaksch, in 1888, as being characterised by great enlargement of the spleen, and sometimes of the liver and lymphatic glands; by oligocythæmia, and great permanent leucocytosis. It thus stood midway between pernicious anæmia and true leucocythæmia, and it was believed that it might progress in one or other of these directions, or in rare cases be recovered from. Further observation, however, showed that the blood had one other peculiarity—and this a more constant one than those just mentioned. Luzet found nucleated red blood-corpuscles, many of them undergoing mitosis, in larger number than was to be seen in any other disease. As cases were recorded, and the disease more thoroughly studied, it became evident that the children affected were almost always rachitic; in a few there was syphilis, and in one or two tuberculosis, but it appears that hardly a case has been described where some constitutional disease was not present in addition to the anæmia. Again, in rickets and syphilis hypertrophy of the spleen may occur without the necessary supervention of anæmia, and we have already stated that leucocytosis is common in all the severer types of infantile anæmia. From the examination of the blood estimations in a considerable series of secondary anæmias of all kinds, it seems moderately certain that splenic enlargement, leucocytosis, and severe anæmia tend to occur together, and that rickets and syphilis are frequent accompaniments.

Looking at the subject from another point of view, it will be found that, if the blood be carefully examined in a number of cases all clinically resembling each other in showing enlargement of the spleen and anæmia, we can arrange these cases in a fairly definite series of decreasing severity, the members of the series passing insensibly one into the other. At the top we have a great oligocythæmia, a leucocytosis of 60,000 or more, a number of erythroblasts—some showing mitosis; lower down we have fewer leucocytes, more red corpuscles, and fewer erythroblasts; still lower, a simple anæmia or chlorotic condition of the blood—a splenic anæmia; and at the foot of the series a case where the blood condition is practically normal and only a simple hypertrophy of the spleen exists. We have never had an opportunity of tracing the evolution of a severe case from a mild one, but in one patient we were able to follow the changes from a typical condition resembling that described as pseudoleukæmic anæmia to what was, to all intents and purposes, a simple anæmia. It will thus be seen that it is extremely difficult to say where the disease of which we are speaking ends, and where a simple or splenic anæmia begins. In our opinion, though in certain cases the blood change is quite a distinct and characteristic one, there is not sufficient evidence to warrant us in regarding the condition as a disease *sui generis*, or even in separating it from syphilitic or rachitic anæmia with splenic tumour.

Pseudoleukæmic anæmia affects children between the ages of six months and two years, and is often associated with rickets, less frequently with syphilis or gastro-intestinal disorder. It rarely exists as a primary malady.

The anatomical changes consist in a simple hypertrophy of all the components of the spleen; the organ contains a number of hæmoglobin-bearing cells. In the liver the appearance on section is suggestive of what is seen in the fœtus; the lobulation is indistinct, and here and there throughout the organ large cells, with multiple or irregular nuclei quite similar to the hæmopoietic cells of the fœtal liver, are seen. Small polyhedral cells (erythroblasts) which bud off from these may also be present. In other cases the liver does not show any striking abnormality, even when the characteristic blood change is very marked. The bone marrow shows evidence of increased hæmopoiesis; the glands are increased in volume.

Blood.—The specific gravity and hæmoglobin are decreased. The latter may be as low as 20 per cent. or less. The red corpuscles are considerably diminished; from two to three millions is perhaps the usual figure, but in one of von Jaksch's cases they descended below a million. The leucocytosis varies from 40,000 to 80,000 or more per cmm. On staining blood films the red corpuscles are seen to be much altered; few are of normal appearance; microcytes, megalocytes, and poikilocytes are abundant, but the most striking feature is the number of erythroblasts present. In a marked case one or two of these may be seen in almost every field of the microscope; normoblasts, poikiloblasts, megaloblasts, and microblasts are all present; the nuclei are in many cases irregular in outline, double, trefoil, or undergoing mitosis. Here and there some are seen in process of extrusion from the cell body, others are swimming free in the plasma. The leucocytosis is essentially polymorphous, but the younger forms of cell predominate. In place of forming about 42 per cent., the multinuclear cells will form perhaps 25 per cent. of the total, the mononuclear and transitional leucocytes making up the remainder. The number of the eosinophiles varies greatly. Marrow cells (myelocytes) occur with comparative frequency. Some of the leucocytes may be seen to be undergoing mitosis.

The **symptoms** develop gradually. The patient becomes more and more anæmic, and eventually a swelling can be observed filling the greater part of the left half of the abdomen. The tumour has the usual characters of chronic splenic hypertrophy. The glands may also become slightly enlarged. The lower edge of the liver may lie anywhere between the normal position and the umbilicus. The skin and mucous membranes are pale; a lemon-coloured or waxy tint is sometimes observed. There are, occasionally, small petechiæ scattered over the body. The patient is usually ill-nourished, but, apart from a constitutional disease or a complication, no other symptoms are manifest. The urine may contain a trace of albumin; it also in some cases contains albumoses. These result from the excessive breaking down of leucocytes, and with their presence an excess of uric acid might be expected. It is, however, somewhat difficult to collect the urine with sufficient regularity to speak exactly on this point.

The **course** of the disease is chronic. In severe cases the **prognosis** is bad, but, under appropriate treatment, the splenic hypertrophy may completely subside, and recovery from the anæmia ensue. It is not easy to ascertain the period required for this, but it is certain that a spleen filling one half of the abdomen may become almost imperceptible in the course of eleven months, and in the same time the blood may revert from the characters described above to a normal condition. Many cases prove fatal from asthenia or from some intercurrent illness.

Pathology.—It is believed that the essential feature of the disease is the return to the condition of fœtal hæmopoiesis, in response to an excessive demand on the blood-forming organs. On this hypothesis, the limitation of the disease to the earlier months of life, the occurrence of the enormous numbers of nucleated red corpuscles in the blood, and the changes found in the liver, can be explained.

Diagnosis.—When the blood condition described above is found associated with enlargement of the spleen the case may be regarded as belonging to the group of pseudoleukæmic anæmia. But if we find (say) oligocythæmia amounting to three millions, leucocytosis of 25,000, and perhaps half a dozen nucleated red corpuscles in the film, what shall we say? Or, if we find with the enlarged spleen a chlorotic or simple anæmic condition, such as is present in the splenic anæmia of adults? In the present state of our knowledge all that can be done is to describe each case in accordance with the exact state of the blood, leaving to future experience to decide whether it should be regarded as a pseudoleukæmic anæmia, a splenic anæmia, a lymphadenoma (Hodgkin's disease), or a case of simple splenic hypertrophy.

Treatment.—Most benefit is got from the use of remedies directed against the constitutional malady. Here antirachitic treatment will hold a place. Iron and arsenic may advantageously be added.

DISEASES OF THE SPLEEN.

Those in which most practical interest exists are acute and chronic enlargements and degenerations.

ACUTE ENLARGEMENT OF THE SPLEEN

is present in many infectious diseases, especially in enteric fever and malaria. It also occurs in gastro-intestinal catarrh and several other conditions.

CHRONIC HYPERPLASIA

is met with in rickets, congenital syphilis, leukæmia, splenic anæmia, Hodgkin's disease, malaria, &c. Waxy disease of the organ may also occur. Tumours of the spleen are even rarer in childhood than in later life.

The greatest interest attaches to the enlargement occurring in rickets and syphilis, and to the relation of this, as well as of splenic hypertrophy generally, to anæmia. It may be said that the spleen of an infant is prone to enlargement in very many diseases, but that excessive overgrowth comparable to that occurring in leukæmia is uncommon. It appears that the enlargement in rickets is, when great, more or less accidental. Statistics from the *post-mortem* room show that if we take, on the one hand, all cases dying with marked signs of rickets, and on the other, cases (exclusive of infectious diseases, in which splenic enlargement is of constant occurrence) showing no sign of rickets, a greater or less degree of hypertrophy is nearly as common in one series as in the other (*Starck*). Looking at the matter from the opposite point of view, and without quoting authorities, we may state that in a series of sixty cases of simple enlarged spleen all were rachitic; out of another of fifty-four cases thirty-five were rachitic; out of a third of sixty cases forty were rachitic. Lower estimates put the proportion of splenic enlargement in rickets at 40 per cent. It appears that those cases, both of rickets and syphilis, in which great hypertrophy of the spleen is observed, are almost always anæmic; and the form of anæmia present may be either simple—in which case we have the clinical picture of splenic anæmia—or of the variety known as pseudoleukæmic anæmia. Whether in such cases the anæmia or the splenic enlargement is primary, and whether they are the direct results of the rachitis, are questions as yet unsettled.

In the cases under consideration the change in the organ consists of a simple hyperplasia with, it may be, some increase in the fibrous tissue. The recognition of the splenic overgrowth is easy. It is made by palpation; a diagnosis cannot be arrived at by percussion alone. When the organ can be distinctly felt under the costal margin it may be regarded as enlarged. In higher grades of hypertrophy the shape of the organ and the presence of the notch are sufficiently distinctive. The symptoms must, of necessity, depend on the condition to which the splenic lesion is due. Henoch describes a white, waxy complexion as especially characteristic; to this may be added dropsy of the feet and eyelids, and small petechiæ. These must depend on the degree of anæmia present. The diagnosis of the cause of the condition may not always be possible. When a distinctly leucocythæmic state of the blood is found, the case is, of course, one of leucocythæmia. Otherwise the relationship of splenic hypertrophy is often difficult to understand.

The condition itself calls for no special treatment. Our efforts are rather directed against the concomitant disease, and in cases of rickets and anæmia the improvement of these conditions will often be accompanied by a return of the spleen to its normal size.

DISEASES OF THE THYMUS.

With one exception, abnormalities of the thymus have little clinical interest; but, since it is probable that a simple enlargement may lead to fatal dyspnœa, it is necessary to say a few words on the subject.

An infant, hitherto in apparent health, is suddenly seized with frightful dyspnœa, rolls its eyes, clenches its hands, and dies in a moment or two without a cry. In other cases the child is found dead in bed, and the suspicion of foul play may be aroused. On *post-mortem* examination nothing is found save an enlargement of the thymus sufficient to compress the trachea. Occasionally the symptoms have been less acute and have resembled those of ordinary laryngeal obstruction. In one such instance tracheotomy was fruitlessly performed; then the surgeon opened the mediastinum, pulled forward the thymus gland, and gave immediate relief to the symptoms. Such is an outline of the clinical history of these cases. The condition is usually unrecognisable during life, but in some of the chronic cases a little dulness over the upper part of the sternum has led to a diagnosis.

The exact relation of enlarged thymus to sudden death is still under discussion. Pathologically, it is not easy to show that pressure has actually been exerted; indeed, the signs of rapidly fatal asphyxia and heart failure are not very dissimilar from each other. Why death should occur so entirely without warning is unknown. It may be that there is an acute engorgement of the thymus, or (as some have held) that death results from sudden falling back of the head compressing the trachea against the enlarged organ, the weakness of the child's muscles being too great to allow of its restoring the head to a more natural position. The condition is limited to young infants. The relation between thymic enlargement and certain cases of asthma and laryngismus stridulus is unsettled, but does not appear to be a very close one.

Syphilis, tubercle, various forms of new growth, and inflammation of the thymus may also occur.

CHAPTER XIV.

DISEASES OF THE CIRCULATORY SYSTEM.

Contents.—Acute Endocarditis and Pericarditis—Malignant Endocarditis—Chronic Valvular Disease—Adherent Pericardium——Myocarditis—Functional Affections of the Heart—Affections of the Blood-vessels—Congenital Affections of the Heart.

ACUTE ENDOCARDITIS AND PERICARDITIS.

BOTH endocarditis and pericarditis are common in childhood; they are frequently associated with each other, and with a certain amount of myocarditis. Since they usually have the same origin and give rise to somewhat similar symptoms, they may be considered together.

Etiology.—Whilst either endo- or pericarditis may arise in the course of a septic infection, as in the case of some of the pyogenic diseases of the newly-born, or may follow certain infectious diseases, especially pneumonia; and whilst pericarditis may develop in the course of Bright's disease, or be due to the deposit of tubercle in the pericardium, or result from the extension of inflammation in neighbouring organs—in short, whilst either of these conditions may result from any of the causes which will produce it in the adult, the great and important etiological factor in the child, just as in the adult, is the rheumatic poison. Hence these cardiac inflammations appear most frequently at the period when rheumatism is most common—*i.e.*, above the age of four years; and, for the same reason, girls are more frequently affected than boys. It must be remembered, however, that the rheumatic cardiac affections of childhood do not often occur as complications of acute articular rheumatism. They are frequently met with as precursors of the arthritis; and, in the majority of cases, in younger children especially, there is never any affection of the joints, but only erythema, tonsillitis, subcutaneous nodules, or some of the other manifestations of rheumatism at this age. Endocarditis is particularly liable to develop during an attack of chorea—this, as we have seen, being almost invariably a manifestation of rheumatism. Both endocarditis and pericarditis, but especially the former, may supervene in scarlet fever, either early in the disease or, later, during the period of desquamation. Such cases are probably the result of true rheumatism, to which scarlet fever seems to predispose, and are not the direct result of the scarlatinal poison.

Morbid Anatomy.—The pathological changes do not differ very greatly from those found in older persons. The valve principally affected is the mitral; the aortic cusps often escape. The right side of the heart is seldom affected in endocarditis occurring after birth. In pericarditis there is a great tendency to effusion, and the effusion is more apt to become purulent than in the adult: this is particularly the case where inflammation has spread from neighbouring structures. Pericarditis often results in adhesion of the parietal and visceral surfaces, but the inflammation may extend to the anterior aspect of the sac, and, by producing a mediastinitis, bind the heart firmly to the adjacent chest-wall and other structures. Tuberculous pericarditis is not uncommon.

Symptoms.—Both endo- and pericarditis, but especially the former, are easily overlooked. This is particularly the case when they develop before other signs of rheumatism have become manifest, if the course has been a somewhat latent one. In more acute cases, however, the symptoms of cardiac inflammation are well marked. The patient becomes anxious and distressed, there is dyspnœa or hurried breathing; pain in the chest is complained of; there may be vomiting, prostration, or even delirium. Pallor is often well marked. The temperature is not much raised in cardiac inflammation *per se;* it may even remain normal. Such symptoms, occurring along with any of the manifestations of rheumatism—erythema, subcutaneous nodules, chorea, tonsillitis, &c.—or following them, should lead us to suspect the presence of an endo- or pericarditis; and if there be much dyspnœa, distress, and pain at the chest, the probability is that the pericardium is affected. As regards the signs of the two conditions, pericarditis will be first discussed, then endocarditis.

PERICARDITIS.

The heart's action is tumultuous and irregular, and this alteration in the character of the beat may be observed before any other indication of pericarditis is present. Friction, however, can soon be detected, in most cases by palpation as well as by auscultation. The rub (usually double, but perhaps only with systole), produced apparently close to the ear, and audible at first towards the base of the heart, is not likely to be mistaken in the child for an endocardial murmur, as at this age aortic bruits are uncommon. If pressure be applied with the stethoscope the sounds become more marked, and the patient usually complains of pain. Occasionally the friction sound is only heard after pressure has been applied. In addition to the friction, alteration in rhythm is usually detected: occasionally the *bruit de galop* or "triple rhythm" may be present. Percussion from day to day is very important, both as regards diagnosis and prognosis; for often an extension of the area of cardiac dulness can be detected early in the course of the illness, and, by watching the growth of this, an idea can be gained of the amount of effusion present. It must be said, however, that in pericardial effusions in childhood the area of dulness, though much enlarged, is not so typically triangular as in adults. With the extension of dulness, pericardial effusion leads to displacement of the apex beat upwards and outwards, whilst the sounds become very distant. The progress of the inflammation from plastic exudation to the effusion of fluid is not orderly; hence signs of both may be present together. The friction-sound may vary greatly in degree; it may be marked in slight cases, and very difficult to detect in severer ones.

ENDOCARDITIS.

On examination of the heart a cardiac murmur is heard. The commonest murmur is systolic, soft, and heard at the mitral area—being due to mitral regurgitation; later, accentuation of the second sound at the pulmonary orifice becomes evident. At first, however, it is extremely difficult, if not impossible, to distinguish an organic murmur from one of relative insufficiency. Cardiac distress, quickening and irregularity in the sounds, and variations in the character of the murmur from day to day, all suggest that the lesion is endocarditic and not functional. Besides mitral regurgitation, mitral stenosis frequently results: the first sign of this is an apparent reduplication of the second sound heard only at the apex; gradually, diastolic and presystolic mitral murmurs—or only one of these—make their appearance.

When there is great pain in the chest and much dyspnœa in a child with an endocardial bruit, a pericardial inflammation probably also exists, though, of course, there are some exceptions to this rule. In both pericarditis and endocarditis the pulse is rapid, but it is more apt to become irregular and weak when there is pericarditis, or when myocarditis is present.

Course.—Heart inflammations may run a more or less acute course or may be latent. In the former case we have the development of such symptoms as have just been described, usually in association with other rheumatic manifestations; and, when the heart is examined, signs of pericarditis, or endocarditis, or both, are present. A pericardial effusion will probably reach its height within a week and subside more slowly. Death may occur at any time: thus, although the physical signs show no very distinct alteration, the pulse may grow feebler and the general symptoms—vomiting, delirium, prostration—become more marked until a fatal issue ensues. In other cases death may result from fatal syncope.

In the latent group of cases the child, though out of sorts, has no very definite complaint; but, on examination, an endocardial murmur or, it may be, a pericardial effusion is discovered.

Sometimes the signs of disease disappear altogether; usually a permanently damaged heart is left, and at any period of the rheumatic manifestation an acute attack of inflammation of the heart may ensue and possibly prove fatal.

Diagnosis.—It may assist in diagnosis to consider the cases as occurring clinically in the following groups:—(1) In children who have shown no previous signs of cardiac lesion or of rheumatism. (2) In the course of, or during, convalescence from some rheumatic condition. (3) Supervening in a child whose heart has been previously damaged and shows signs of old-standing valvular lesion or pericardial adhesion.

In the first group of cases the diagnosis rests entirely on the physical examination. When distinct signs of pericarditis are detected, the endocarditis may, and probably will, be concealed; we are, however, almost justified in assuming its presence. In the second group of cases the occurrence of the general symptoms is highly suggestive of cardiac mischief; but they must not be waited for before examining the heart. Therefore, in chorea, in articular rheumatism, in many cases of tonsillitis, in cases where nodules are present; in short, in all rheumatic diseases and in diseases where rheumatism may occur (as in scarlet fever), the heart should be kept under close observation. In the third series of cases the supervention of the general symptoms should guide us as to the occurrence of inflammation of the heart; in addition there will probably be some local sign, such as a pericardial rub or an alteration in the character of the murmurs. These cases have also this peculiarity—we do not often find children suffering from failing compensation in the same sense as we do in adults. Where the lesion is not so great as to render life impossible, the heart has great power of compensation. In fatal cases of chronic valvular disease the usual symptoms are dyspnœa, vomiting, anxiety, prostration, and delirium, with greatly disordered cardiac action, and death ensues without any marked evidence of backward pressure—without much dropsy or pulmonary œdema. In such cases *post-mortem* examination shows signs of recent acute inflammation; and it is to this rather than to failure of compensation that we must attribute the death; to this that we must look for an explanation of the symptoms; and it is against this, rather than against gradual failure of the heart muscle, that we must direct our treatment.

Prognosis.—These cardiac inflammations occasionally prove fatal at the first attack; in rare instances they may be completely recovered from. Generally, however, they leave behind a damaged heart, which leads to death, either during childhood, from repeated attacks of inflammation, or, should the patient survive these, from failure of compensation at a later period. Complete recovery is more often observed in childhood than in the adult;

murmurs, undoubtedly organic, have been known to disappear, the heart showing no subsequent sign of disease. Pericarditis is more frequently recovered from than endocarditis, or, at least, leads to results which give no clinical evidence of their existence.

The prognosis depends then on—(1) **The severity and extent of the inflammation, and the previous state of the heart.** Pericarditis with effusion is obviously more serious than dry pericarditis, and, in the child, the risk of the effusion becoming purulent is greater than in the adult. (2) **The intensity of the general symptoms.** When these are severe the prognosis is worse than it is in latent cases. One symptom is of particular importance—viz., vomiting. Vomiting is a frequent precursor of the gravest symptoms in cardiac cases. Not only in endocarditis and pericarditis, but also in other cases where death ensues from cardiac failure—as in diphtheria—the first signal of danger is frequently given by uncontrollable vomiting. When delirium, prostration, dyspnœa, anxiety, and vomiting are present, the case is to be looked upon as a very grave one. The state of the pulse is a very important guide to estimating the working capacity of the heart. (3) **The intensity of the rheumatic poison.** The occurrence of a series of attacks of rheumatism or its manifestations is indicative of a marked predisposition to the disease. But the sign on the prognostic importance of which all are agreed is the appearance of rheumatic nodules. These, occurring during the course of an acute cardiac inflammation, or even of chronic valvular disease, are a sign of gravity. (4) **The date at which the case is recognised and put under treatment.** In cases with indefinite symptoms only, dilatation of the heart is much more likely to supervene in children who have been going about during the illness, than in those who have been kept at rest. The result is that there is much greater risk in the former than in the latter of the heart giving way from failure of compensation at a comparatively early age.

Treatment.—Absolute rest in bed is probably the most essential part of the treatment; the necessity for this will be obvious from what has been already said. Long after all signs of the acute process have subsided, the patient should be kept on his back, partly to prevent the onset of much dilatation of the heart, partly in the hope that a more complete absorption of the products of inflammation, and possibly an ultimate cure, may be effected. The general treatment is that of rheumatism; the diet should be light, the dress and bed clothes woollen, salicylates and alkalies should be given together, and continued unless the heart gets so weak as to contra-indicate their use. For the præcordial pain light poultices, or (what is often more grateful to the patient) ice may be applied. If there be much dyspnœa, and indeed in most cases, leeching over the præcordia will be found of some value. Where there is some effusion, and after the more acute stage of pericarditis, small flying blisters, cautiously used, may be advantageously applied; they are probably of no value in endocarditis, and only irritate the patient.

For pain and præcordial distress morphia in small doses is of the greatest service. If the pericardial effusion becomes excessive, paracentesis may be required; it is practically without danger and is best done in the fifth space on the left side of the sternum. Should the fluid become purulent drainage is necessary.

As regards the general symptoms, the restlessness may be met by doses of bromide of sodium or ammonium, or by paraldehyde. Chloral, if used at all, must be given very cautiously and the effect carefully watched. If the temperature runs high, sponging, or the application of ice, may be tried; antipyretics should not be used, except perhaps phenacetin.

Stimulants should only be given when the pulse shows that they are required to avert immediate danger. Digitalis is generally regarded as contra-indicated in the acute stage of peri- and endocarditis.

In the later stages quinine is often of great value, and it is advantageously combined with iron.

MALIGNANT ENDOCARDITIS.

This is rare in childhood, though after the age of twelve or fourteen it becomes more common. The disease does not present many features differing from those in the adult.

CHRONIC VALVULAR DISEASE.

Etiology.—Chronic endocarditis is, in the vast majority of cases, the result of previous acute endocarditis, and is, therefore, usually of rheumatic origin. It is probable, however, that traumatism and strain may at least predispose to its occurrence. Syphilis and nephritis occasionally lead to its production. Congenital abnormalities of the heart are apt to have a chronic endocarditis superimposed on them; in these cases the right side is, of course, chiefly affected. Whilst chronic valvular disease usually follows acute endocarditis, it predisposes to subsequent fresh attacks of acute or subacute endocarditis.

Morbid Anatomy.—The pathological changes resemble somewhat closely those in the adult. The aortic valve is less frequently affected; the mitral valve, on the other hand, is frequently diseased, and stenosis is relatively common. We have seen that more girls than boys suffer from rheumatism, and as mitral stenosis is common in children, this would to some extent explain the much larger proportion of cases of mitral stenosis in women than in men.

Symptoms.—The physical signs are much the same as in after-life; the commonest murmur is systolic, and is heard best in the mitral area. If this has lasted for a considerable period it is almost certainly organic; functional murmurs are not very common in children. Should any doubt exist, the presence or absence of hypertrophy may assist in deciding the question.

Mitral stenosis is usually associated with the presence of a presystolic thrill and murmur, as well as by the absence of any displacement of the apex-beat, if the case be one of simple stenosis. Often, however—more frequently, perhaps, than in adults—there is a mitral diastolic murmur, and perhaps also thrill, either with or without the presystolic. In other cases there is no evident murmur, but merely a very sharply accentuated first sound, which should always make one suspect the presence of mitral stenosis ; and, along with that, a reduplication of the second sound at the apex, but not at the base. This is probably in reality an early diastolic mitral murmur ; the fact that it is not well heard at the base shows that it is not produced by the sigmoid valves.

Dilatation of the right side of the heart is usually considerable in both mitral incompetence and stenosis.

Tricuspid regurgitation from valvular disease, though rare, is more frequent than in adults. It usually comes on in very early life, and may be fœtal in origin. The signs are much the same as in the adult, but the jugular and liver pulsations are not so distinct. Chronic pulmonary endocarditis, apart from congenital heart disease, is practically unknown. Aortic disease is relatively less common than in adults.

Chronic valvular disease may be present without any symptoms whatever, and, unless a physical examination of the heart were made, might never be suspected. This is due to the fact that, for a time at least, compensation is very satisfactorily established. In many of these cases, owing to the great hypertrophy of the heart, there is a suspicious prominence of the præcordial region. In other cases, however, the child is always more or less ailing—particularly is this so when there is a considerable degree of mitral stenosis. On the least exertion, breathlessness, palpitation, and præcordial discomfort, as well as a greater or less degree of cyanosis, are present. As a rule, however, the child keeps wonderfully well till some acute disease supervenes, whereupon the compensation gives way, and the usual symptoms of cardiac disease (depending on the valve affected) ensue. The period of puberty is also a very trying time, for then the circulation becomes considerably taxed, and frequently enough the handicapped heart begins to give way. This is why a large number of cases of mitral stenosis are first discovered in girls at this age.

As regards the various symptoms, cyanosis is a much less prominent feature of mitral disease than in adults ; indeed in children there is often pallor rather than the dusky flush of the face. Dyspnœa, and often orthopnœa, supervene in bad mitral cases, and when œdema appears it is of worse prognostic omen than in later life, for it is frequently associated with nephritis. The slowly-increasing œdema of cardiac failure is not common in childhood. In severe mitral cases pulmonary apoplexy, epistaxis, and other forms of hæmorrhage may occur, and bronchitis and broncho-pneumonia are apt to supervene. Secondary effects from emboli, &c., occur as in adults.

Diagnosis.—There is seldom any difficulty in diagnosis: the chief danger lies in omitting to examine the heart because of the comparative absence of symptoms. Congenital heart affections have murmurs, usually loudest in a different area, and there is generally more cyanosis present, along with clubbing of the fingers, and great increase in the number of the red corpuscles. In some cases these are not present, however, and one must then be guided by the murmur and the history of the case.

Prognosis.—The great danger of chronic endocarditis in the child lies in the liability to subacute attacks supervening. Chronic valvular disease *per se* rarely gives rise to much anxiety during childhood, but it is so frequently associated with pericarditis, and perhaps myocarditis, that the probability of these being present must be considered. Acute illnesses become much more serious, and, as we have seen, the age of puberty is a very trying one. The gravity of mitral stenosis to a woman is well known.

Treatment.—Under ordinary circumstances the child with chronic valve disease should not be kept too much at rest. Gentle exercise, and even sports not entailing too great or sudden strain may be indulged in, and massage is beneficial. He should be protected from cold and wet, should always wear woollen underclothing, and whenever the slightest rise of temperature occurs, or any of the signs of rheumatism appear, should be put to bed at once. The bowels must be kept regular, as overloading of the alimentary canal is very apt to upset the heart. When symptoms of cardiac failure supervene, the treatment must be conducted on the same lines as in the adult.

ADHERENT PERICARDIUM.

This is a frequent result of pericarditis in children. In some instances only the two layers of the pericardium are adherent by a few trabeculæ, or by firm fibrous tissue all over the surfaces, but in a large proportion of cases, owing to the presence of external pericarditis (mediastino-pericarditis), not only are the layers of the pericardium bound together, but the heart itself is fixed to the anterior thoracic wall. Adherent pericardium is nearly always associated with great hypertrophy and dilatation of the heart. In nearly all cases, except in the very young, the condition is rheumatic in origin.

Symptoms.—In some cases adherent pericardium is found *post mortem*, where it has never been suspected during life. Indeed, there is seldom sufficient evidence to enable us to diagnose the condition definitely; although from the history of the case, and the presence of an hypertrophy of the heart greater than would be sufficient to compensate for the valvular lesion present, as well as from the fact that the condition is one to which children are liable, its presence may be suspected. Where there is adhesion of the heart to the chest-wall we may get more definite signs. Thus the apex-beat may be fixed—*i.e.*, not varying with change in the position of the patient—or there may be a dragging in of the lower ribs and the xiphisternum with systole. Retraction of the intercostal spaces above the apex is of no diagnostic value. Want of movement of the central part of the diaphragm, due to the adhesion of the heart thereto, is said to be a sign of value—the result is absence of the bulging of the epigastrium with inspiration. Indrawing of the lower ribs laterally and posteriorly is also present in some cases of external pericarditis; whilst diastolic collapse of the veins of the neck has been looked on as indicative of an adherent pericardium. One or more endocardial murmurs are present in most of the cases, and the hypertrophy and dilatation of the right side of the heart is marked.

Dyspnœa, breathlessness, and cyanosis may be present, especially where bronchitis or some other condition increases the heart's work. Œdema may ensue, either from gradual heart failure or, occasionally, from compression of the great veins as they pass to the heart.

The **diagnosis** is often very difficult. Where pericarditis is present, as shown by friction, the continuance of this for some time, and the persistence of much dilatation, are suspicions of ensuing adherent pericardium. Hypertrophy and dilatation of the heart out of proportion to the auscultatory signs are often due to pericardial adhesions. When the heart is fixed to the anterior chest-wall the most important direct signs are fixation of the apex-beat, distinct dragging in of the lower ribs and xiphisternum, and perhaps want of respiratory movement in the epigastrium. Of course one or all of these may be absent.

The **prognosis** depends chiefly on the associated conditions, especially on the amount of dilatation, and on the valvular lesion. Adhesion of the heart to the chest-wall increases the heart's work and tends to shorten the patient's life more or less. Mere adhesion of the two layers of the pericardium, without much dilatation, is probably almost harmless.

Treatment.—After adherent pericardium is actually present not much can be done. The possibility of its occurrence, however, should keep one on his guard during attacks of pericarditis, so as to prevent, as far as possible, the heart becoming fixed in a position of dilatation. When signs of backward pressure are present, cardiac tonics and the remedies used in other forms of heart failure are indicated.

MYOCARDITIS.

Myocarditis may be acute or chronic; the latter is often the result of the former. It most frequently occurs in rheumatism, where it is associated with endo- and pericarditis, and renders the heart very liable to dilatation. It may also be present after various acute diseases, especially scarlet fever, diphtheria, and septicæmia. There are no very distinctive symptoms of myocarditis; when it is present the pulse is usually rapid, of poor tension, and irregular, whilst the heart-sounds are very feeble; but, of course, all these may occur without any myocarditis. In septic cases small abscesses may form in the heart-wall.

Syphilis of the heart may occur as a diffuse fibrosis or as one or more gummata in the heart-wall. The symptoms vary greatly; sometimes sudden death occurs, so when heart symptoms supervene in a child with congenital syphilis, in the absence of any definite recognisable heart lesion, syphilitic myocarditis should be thought of.

FUNCTIONAL AFFECTIONS OF THE HEART.

These are rare, except in the later years of childhood. When present, they are most commonly connected with derangements of the alimentary canal; they may also follow a fright, be due to tobacco, tea, or coffee, or, in older children result from self-abuse. The strain thrown on the circulation at puberty predisposes to their appearance at that time.

Symptoms.—The chief symptom is palpitation, which is commonly associated with præcordial discomfort or pain. There is usually also some dyspnœa, perhaps even orthopnœa. The pulse is generally rapid, of poor tension, and has a tendency to become irregular; occasionally there may be bradycardia, but this is rare. Faintness, giddiness, and various other symptoms may also be present, and there may be a functional murmur which afterwards disappears.

The **diagnosis** must never be made without previously eliminating all possibility of organic disease, and the **treatment** consists in the careful regulation of the diet and bowels, and in the prohibition of tobacco, tea, and coffee, if these are being taken in excess. As regards drugs, digitalis in small doses, belladonna, and bromides are amongst the most valuable.

AFFECTIONS OF THE BLOOD-VESSELS.

Arterial thickening, atheroma, and aneurism are extremely rare in childhood; embolism occurs not infrequently in valvular disease; thrombosis of the intracranial sinuses is found in various local and general conditions, and is referred to more fully in the chapter on *Diseases of the Nervous System*.

Arterial Hypoplasia signifies an unusually small size of the arteries; this has been detected in some cases of chlorosis, and has been suggested as one of the causes of that condition.

CONGENITAL AFFECTIONS OF THE HEART.

A short notice of the development of the heart is a necessary preliminary to the consideration of its congenital affections. The following is taken from Ziegler's *Pathological Anatomy*:—"The heart is originally formed out of two lateral mesoblastic tubes which coalesce into an undivided straight tube. This single tube is continuous in front with the two primitive aortas, and posteriorly it receives the two vitelline veins from the vascular area. In consequence of the continued growth of the single tube it becomes doubled on itself into an S-shaped structure, and presently, by slight constrictions, three somewhat sacculated sections can be made out. The anterior, almost straight section, is the aortic bulb ; the middle section has somewhat thickened walls, and forms the ventricular portion ; the posterior section is thin-walled, and forms the auricular portion. By the continued bulging and growth of the ventricular portion the aortic bulb and the auricular portion are brought into approximate juxtaposition, and sometimes seem to twist round each other. The ventral bulge of the ventricular portion indicates the position of the future apex. The next step is the separation of the ventricular portion into two chambers. This begins to take place about the seventh week, by the development of a low crescentic fold from the inner surface of the right wall below, whilst an evanescent notch appears at the corresponding spot outside. The fold grows rapidly upwards towards the auriculo-ventricular opening, where it is in relation both with the auricular portion and the aortic bulb. For a time, therefore, communication between the ventricles is free, over the top of the septal fold.

"The septum of the auricles begins to appear about the eighth week as a low crescentic fold, starting from the anterior wall of the auricular portion and the upper edge of the ventricular septum. In the tenth or eleventh week two other folds grow up from the posterior wall, one coming forward to meet, without adhering to, the anterior fold, and forming the valve of the foramen ovale ; the other fold is the Eustachian valve. The auricular septum thus remains incomplete until after birth, when the valve usually coalesces with the margin of the foramen ovale, and the latter ceases to be patent.

"The division of the arterial bulb begins about the seventh week, by the development of an internal septum proceeding from the distal end towards the ventricles. Two channels are thus formed from the single cavity, and the direction of the septum twists in such a way that the anterior channel (pulmonary artery) becomes continuous with the cavity of the right ventricle, and the posterior channel (aorta) with the cavity of the left ventricle. The septum ultimately meets and joins the septum of the ventricles."

Congenital affections of the heart are commonly divided into three groups :—(1) The persistence of fœtal structures which usually disappear at or soon after birth—*e.g.*, patent foramen ovale, patent ductus arteriosus.

(2) True anomalies of development—development being either abnormal, or having stopped short in its course—*e.g.*, imperfect interventricular septum, imperfect auricular septum, transposition of the great vessels.

(3) Cardiac affections resulting from endocarditis. The valve most commonly affected is the pulmonary, and stenosis is usually the result, whereas incompetence is rare. The tricuspid, mitral, and aortic valves, especially the first, may also be affected. There is evidently no doubt that hearts with anomalies resulting from developmental error are much more liable to endocarditis than are normal hearts.

Although such a division as that just given is of value in the description of these congenital heart affections, it must not be supposed that the lines of demarcation between one section and the others are very distinct; for it will be readily understood that if, for example, fœtal endocarditis lead to some interference with the usual course of the intra-uterine circulation, secondary results in the direction of defective development may ensue. Thus, pulmonary stenosis frequently leads to imperfect ventricular septum, patent ductus arteriosus, and patent foramen ovale.

Many of the less important abnormalities of the heart, such as dextrocardia (where the heart is on the right side of the body), abnormal number of the segments of the sigmoid and auriculo-ventricular valves, &c., will not be further mentioned here. Transposition of the great vessels may be found, so that the aorta springs from the right ventricle and the pulmonary artery from the left; or the aorta may rise partly from one ventricle and partly from the other.

Aortic, mitral, and tricuspid affections need be no more than mentioned, as they present few features distinctive of congenital heart disease. Tricuspid disease is, however, much more common than in adults.

Pulmonary constriction or atresia is one of the commonest forms of congenital heart affection. The amount of stenosis varies from the slightest degree of narrowing up to complete obliteration. The constriction may be at the level of the valves, when it is usually due to endocarditis; or at the conus arteriosus, when it is nearly always developmental. There are practically always secondary results—viz., great dilatation of the right ventricle, and a patent ductus arteriosus allowing a sufficient quantity of blood to reach the pulmonary artery beyond the point of constriction; in the majority of cases there is also imperfect closure of the interventricular septum, and often also a patent foramen ovale. Analogous **constriction of the aorta** is rare.

Imperfect Interventricular Septum.—There may only be the slightest communication between the two ventricles, or the septum may be so little developed that there is practically only one ventricular cavity. As the septum grows from the apex, the deficiency is in the upper part, usually just in front of the undefended space; and a frequent result is that the aorta communicates with both ventricles. In a few cases the posterior part of the septum is absent. The failure to close is frequently due to abnormally high pressure in the right ventricle, as in pulmonary stenosis.

Imperfect Interauricular Septum.—The septum may be almost unrepresented ; much more commonly what exists is a **patent foramen ovale.** This opening, which usually closes in early infancy, is in many cases prevented from doing so by undue pressure in the right auricle, resulting from some other heart affection. Sometimes patency of the foramen ovale is due to the non-development, or imperfect development, of the valve of the foramen. It must be understood that fine oblique openings, or several small perforations, in the round fossa do not constitute a patent foramen, and do not give rise to any interference with the circulation.

Patent Ductus Arteriosus.—This duct generally closes within a few days of birth, but may remain patent—a condition of affairs usually produced by constriction or atresia of the pulmonary artery or aorta. In such cases the patent ductus allows of both the pulmonary and systemic circulations being carried on by one ventricle.

The **symptoms** vary very greatly according to the pathological condition. Thus, many of the lesions may be present without producing symptoms during life. In all cases, however, where there is distinct obstruction to the circulation, symptoms arise, and in many cases abnormal murmurs are heard at various positions in the chest. The most distinctive symptom is cyanosis, hence "morbus cœruleus," the old term for congenital heart disease. This cyanosis is sometimes extreme, and is usually associated with coldness of the extremities. The cheeks, chin, nose, hands, and feet are most affected, and with it there is often marked clubbing of the fingers. The cyanosis is constant, although it gets worse on exertion or during an attack of bronchial catarrh, &c. It is nearly always present in pulmonary stenosis. Patent ductus arteriosus, unaccompanied by any other serious heart condition, does not lead to it as a rule, nor does a small interventricular opening. The cyanosis may be present at birth, but usually gets worse as life advances. In many cases, especially where the cyanosis is marked, there is also breathlessness and anxiety, which may come on in spasmodic attacks lasting some hours and even longer. Hæmorrhages from the nose, lung, or bowel sometimes occur.

In cases where there is cyanosis there is practically always a great increase in the number of red corpuscles, which may number 6,000,000 to 8,000,000 or 9,000,000 per cubic millimetre. The size of the corpuscles is frequently larger than normal, and the amount of hæmoglobin present is greater. All these—the number of red corpuscles, the size of the individual corpuscles, and the amount of hæmoglobin—seem to increase with the age of the child, just as the cyanosis usually also increases with years. The cyanosis seems to be due to the want of proper oxygenation of the blood, in consequence of the defective pulmonary circulation. The exact cause of the changes in the corpuscles is as yet uncertain ; the obvious suggestion that the polycythæmia is compensatory has not been definitely proved.

In most cases a murmur is heard on auscultation over the cardiac area; in many cases, indeed, the murmur is the only indication of disease present. The murmur is generally loud and widely propagated over the chest. It may at once be distinctly stated, that in nearly all cases, the character, position of maximum intensity, and direction of propagation of the murmur do not, by a long way, furnish sufficient evidence of the exact nature of the lesion, and in few cases of congenital heart affection can a definite and exact diagnosis be given. The murmur is usually systolic, rough, and accompanied by a thrill; it is generally loudest towards the base of the heart. Pulmonary constriction leads to a loud, rough, systolic murmur, heard best in the pulmonary area and conducted towards the left shoulder. The murmur is accompanied by a thrill; the second sound in the pulmonary area is generally faint. A patent ductus arteriosus may exist without any murmur; more commonly, however, a loud systolic murmur is audible about the third space on the left side, a little external to the sternum; it is propagated towards the back, and may sometimes be associated with a diastolic murmur. A patent foramen ovale may lead to a presystolic murmur at the base; as a rule, however, the murmur seems to be systolic. Imperfect interventricular septum may exist without any bruit; usually there is a loud systolic murmur a little to the left, about the level of the fourth cartilage, and well heard also posteriorly. This may exist along with a murmur of pulmonary constriction (which is best heard higher up), but as a rule only one murmur is perceptible. Tricuspid, aortic, and mitral lesions lead to bruits as in the adult. Tricuspid disease, being often stenotic, with or without incompetence, is accompanied by a presystolic and perhaps diastolic, in addition to a systolic, murmur.

Diagnosis.—As a rule, the diagnosis of the condition as a congenital heart affection is not difficult. The history of the case, along with symptoms appearing soon after birth and remaining persistent, together with the great lividity and clubbing of the fingers, suffice to distinguish it from acquired endocarditis, in which cyanosis is not common. But when we try to ascertain the exact condition present, the difficulty is extreme. Pulmonary stenosis is by far the commonest variety, but is, as we have seen, nearly always associated with other lesions. In it cyanosis is usually very marked, but this may also be present in imperfections of the auricular or ventricular septa, in patent ductus arteriosus, &c., and in all these conditions dilatation of the right ventricle is generally present. The position and character of the murmur, as already indicated, may in some cases lead to a diagnosis, but frequently enough we are only, at the best, dealing with probabilities. Where the patient has lived to approach puberty, the likelihood of the case being one of pulmonary stenosis is considerable.

The **prognosis** is on the whole very grave. Serious imperfections of the septa, and transposition of the great vessels usually lead to early death; on the other hand, a patient with a patent foramen ovale may live for many years without symptoms and perhaps even without the presence of a murmur, so that, of itself, the lesion is not very serious. Pulmonary constriction is the form of congenital heart affection which, on the whole, permits of longest life; a fair proportion of cases arrive at maturity and some live to middle age. Most children with other forms of heart disease, except mere anomalies in the number of valves, &c., die within a few years of birth.

Treatment.—Very little can be done either to cure the patient or to alleviate the symptoms when they are severe. The child must be most carefully guarded from cold, as any bronchial affection adds very seriously to the risk. For the severe attacks of dyspnœa which supervene in many cases, alcohol, ether, and other cardiac stimulants may be used, and where no relief seems to be given by these, hypodermic injections of morphia (in small doses) may be tried.

CHAPTER XV.

DISEASES OF THE RESPIRATORY SYSTEM.

Contents.—Rhinitis—Pharyngitis—Adenoids—Retropharyngeal Abscess—Acute Laryngitis—Bronchitis—Pneumonia (Croupous and Catarrhal)—Interstitial Pneumonia—Emphysema—Atelectasis—Enlarged Bronchial Glands—Pulmonary Tuberculosis—Asthma—Inflammations of the Pleura.

RHINITIS.

Acute Rhinitis—a common cold—occurs as the result of exposure, particularly in infants who sweat much about the head, as well as in older children. It also occurs in the early stages of some infectious diseases—*e.g.*, measles; and, apart from this, there can be no doubt that, in some instances at least, it is in itself infectious. Some children are very liable to rhinitis, and repeated attacks predispose to recurrence.

The **symptoms**—sneezing, blocking of the nose, sometimes feverishness and headache, followed by the establishment of a free nasal discharge—are too well known to need description. The catarrh may spread to the frontal sinuses, to the Eustachian tubes, to the lachrymal passages, or—and this most frequently happens—to the pharynx and air-passages, whereupon an ordinary bronchial catarrh develops. Save in infants the affection is quite trivial. In them, however, acute coryza is more serious, and may even prove fatal. They are very liable to it, and, as the catarrh spreads with great rapidity into the larynx and bronchi, should always be treated carefully and kept indoors until the swelling of the mucous membrane has entirely subsided. But even while the catarrh is confined to the nares, serious symptoms may be set up. The infant not having yet learned to breathe through its mouth, respiration is therefore impeded, sleep disturbed, and sucking interfered with. These have been thought to be produced by the forcible drawing in of air through the mouth causing the tongue to fall backwards and thus close the glottis. More likely, however, they are simply due to the swelling of the mucous membrane, analogous to what occurs in the larynx in pseudo-croup, with, it may be, some reflex laryngeal spasm superadded. In young infants the suspicion of syphilis is always raised by the occurrence of rhinitis. Other signs of the disease should therefore be sought for.

The **treatment** of coryza is simple. In older children confinement to one room should be enforced during the acute stage; remedies to cut short the disease are of little value, but nasal sprays such as pine oil in parolein, menthol, &c., are soothing. In infancy the same measures must be taken, and the child kept indoors until all coryza is gone. It is of great importance to assure oneself that the child (if it be sucking at all) is really getting milk from the breast, and not merely retaining the nipple in the mouth though unable to suck. Should the latter be the case the breast milk must be given with a spoon. Internally, calomel ($\frac{1}{6}$ to $\frac{1}{4}$ gr.) is recommended, and the inside of the nostrils may be smeared with oil to prevent crusts forming.

Chronic rhinitis is not uncommon. It is seen in strumous and unhealthy children, and may be of the hypertrophic or the atrophic form (ozæna). **Fibrinous rhinitis** is excessively rare. **Diphtheritic rhinitis** is a serious complication of faucial diphtheria, and will be discussed in treating of that disease. The possibility of its occurrence leads us to examine the throat in all cases of rhinitis.

PHARYNGITIS.

Etiology.—" Sore throat " is a very frequent complaint in childhood. In many cases it is merely a part of some constitutional malady, notably of scarlet fever, where it precedes the appearance of the rash, and of measles, German measles, typhoid fever, &c. In other cases it is symptomatic of, and may be associated with other symptoms of, rheumatism. It is also usually present in septic conditions, and in many gastro-intestinal derangements. But besides these, pharyngitis is often primary. It is most frequently observed in ill-nourished children, particularly in those whose hygienic surroundings are bad; it may be produced by exposure to cold or sudden changes of temperature, or by infection.

Symptoms.—The child complains of pain in the throat, head, or back of the neck; this is aggravated by swallowing, and also becomes worse during the night, as the throat is then dry. There is (sometimes very marked) constitutional disturbance—fever, rapid pulse, dry skin, &c.; the glands behind the angle of the jaw become enlarged and tender. The pain may shoot up into the ears; and there may be a certain amount of interference with hearing, from obstruction to the Eustachian tubes. Cough may be troublesome or comparatively slight; the voice may be rather nasal.

The **prognosis** is good so far as the attack is concerned. Pharyngitis is, however, very apt to recur, particularly if rheumatic, or when the lymph follicles are specially involved. Granular pharyngitis and elongation of the uvula may occur.

The chief difficulty in the **diagnosis** is to eliminate the possibility of some infectious disease, and in particular of scarlet fever. Whenever the temperature is high and the pulse rapid, this disease should be suspected, even although no history of exposure to infection can be obtained. In scarlet fever the throat is more punctate than in ordinary pharyngitis, but this appearance is not present at the very beginning. As we have already stated, the throat should be examined in every child who is the least feverish.

The **treatment** ought always to be begun by the administration of such a laxative as calomel or rhubarb. In rheumatic cases salicylates are valuable, and in most, guaiac will be found useful. Where the child can gargle, soda and borax may be used; and chlorate of potash may be given, either as a gargle or internally. If the patient be too young to gargle, the throat should be syringed regularly. In more chronic cases the use of a paint containing carbolic acid, tannin, or iodine is beneficial.

ADENOIDS.

A hypertrophic condition of the pharyngeal tonsil is a not uncommon event in childhood. Although at times congenital or affecting infants during the first years of life, the symptoms of "adenoids" (as this hypertrophy is called) do not usually become marked until about the fifth year, and after the fifteenth begin to disappear as the tonsil undergoes involution.

The **etiology** of adenoids is not fully known. The condition may develop after one of the infectious diseases—measles, whooping-cough, or diphtheria; it is common in cold and damp climates, and in strumous and delicate children, and there appears to be a family proclivity to it. It often coexists with chronic enlargement of the tonsils.

Symptoms.—Adenoids give rise to local symptoms; to more distant symptoms due directly to the obstructed breathing; and probably to reflex symptoms. As purely local results we find: nasal obstruction, mouth-breathing and snoring at night, deafness from catarrh of the Eustachian tubes and its consequences, nasal speech, and a constant tendency to nasal catarrh. The facies is characteristic. The open mouth gives the patient a dull, stupid expression, the face appears lengthened, the nose is pinched, and the alæ nasi fall in; the naso-labial folds are obliterated, the inner canthus of the eye is drawn down, and the eyelid droops. The palate is often arched or V-shaped. The respiratory obstruction may, though not very frequently, give rise to deformity of the thorax —to pigeon breast or, occasionally, to flattening, with a funnel-shaped depression at the lower part of the chest. Similarly, collapse of the lung may ensue. By reason of the imperfect oxygenation of the blood the growth is stunted, the child is languid and unfit for school work; to this and to the deafness the backwardness of these patients is due. The sleep is often interfered with, and in bad cases may actually be impossible unless the head be raised. Night terrors or nightmare may occur. To give a complete list of the reflex symptoms which have been ascribed to adenoids would scarcely be profitable. Asthma, stammering, laryngismus, enuresis, chorea, convulsions, epilepsy, and many others, are believed on various grounds to be occasionally produced. There seems good reason to suppose that asthma and convulsions, at least, may be due to adenoids.

The disease is liable to be complicated by hypertrophy of the tonsils and by granular pharyngitis. Nasal catarrh and bronchitis are common. The patient with adenoids is more than ordinarily liable to infectious disease, and recent work has shown that the structures themselves may harbour the tubercle bacillus or become the seat of a tubercular deposit.

The **diagnosis** is easy. We are led to suspect the presence of the growths by the symptoms and facies; and, when the finger explores the naso-pharynx, the vegetations can be felt as a cushion of friable tissue, blocking the cavity and bleeding readily when touched.

Except in the mildest cases the **treatment** is operative.

RETROPHARYNGEAL ABSCESS.

Abscess in the retropharyngeal connective tissue occurs as a primary or as a secondary condition. The latter is a result of caries of the cervical vertebræ, and is of much less importance than the primary form. In this—the acute retropharyngeal abscess of childhood—the suppuration takes place in one of the glands behind the pharynx. The disease is usually observed between the second and the twelfth month; sometimes in the second or third year. The patient may be a quite healthy child, or he may be weakly and the subject of eczema of the face, tonsillitis, pharyngitis, stomatitis, or inflammation about the ears. In some cases a traumatic origin, as from the swallowing of hard articles of food, may be detected. Certain acute diseases may lead to retropharyngeal abscess; of these, scarlet fever and erysipelas are the most important. The disease is not a common one, and in most cases no cause can be made out.

Symptoms.—The disease begins somewhat insidiously, but the course pursued is acute. After a few days of indefinite symptoms of illness some local effects become apparent. The first of these are the regurgitation of food and the inability to suck, partly on account of the inspiratory difficulty and partly on account of the pain caused.

Soon the breathing becomes snoring, stridor is noticed both during inspiration and expiration, and the child may be observed to hold its head back and to breathe with the mouth open, so as to allow the air to pass between the base of the tongue and the abscess. The cry becomes hoarse or nasal, according as the abscess is low down or high in the pharynx. As the swelling increases in size, in perhaps a week or ten days from its commencement, the breathing becomes laboured, and attacks of dyspnœa and cyanosis occur during attempts at sucking. The condition can only be recognised by the digital examination of the pharynx. A tense fluctuating swelling is felt, projecting into the mouth either mesially or a little to one side of the middle line. It may be high up above the soft palate, or lower, near the epiglottis, but is usually just opposite the arch of the tongue. The swelling may also be recognised by inspection, but examination by the finger gives a better idea of its nature. With it there is often associated some glandular enlargement in the neck and a certain amount of œdema. If the abscess be left alone the pus may travel down into the mediastinum or may point in the neck, but more often it bursts into the pharynx. And it is in this that the chief danger lies. The rupture of an unrecognised abscess into the mouth, and sudden suffocation by the contents entering the larynx, is not at all an unknown occurrence. Hence such cases should be operated on as soon as they come under observation, any delay being quite unjustifiable. The abscess may also prove fatal by suffocation without rupture.

The **diagnosis** of the condition is extremely simple, provided that the possibility of its occurrence be not overlooked. When once a case has been seen the disease is never likely to be missed. The detection of the abscess rests upon the examination by the finger. In a case of respiratory difficulty in an infant we have to think of the following as possibilities:—(1) Diphtheria. (2) Laryngismus stridulus. (3) Pseudo-croup. (4) Enlarged bronchial glands or thymus. (5) Congenital laryngeal stridor. (6) Foreign bodies. (7) Œdema glottidis. (8) Retropharyngeal abscess.

When the condition is recognised the **prognosis** is good.

Treatment.—The tip of the left index finger is placed upon the swelling; a knife, guarded to within half an inch of its point with plaster, is passed along the finger and plunged into the abscess. The child is held in the upright position, and, after the opening in the abscess is made, the head is inclined a little forward so as to allow the pus to escape. As the knife is withdrawn, the opening may be enlarged with the nail of the guiding finger. The after-treatment consists of syringing with warm boric or alkaline lotion.

ACUTE LARYNGITIS—PSEUDO-CROUP.

Acute laryngitis in children over four years of age corresponds very much with the same condition in adults. In young children, however, it often manifests itself by what is popularly termed "croup," or more correctly, pseudo-croup (spasmodic laryngitis). When we are told that a child has suffered from croup on four or five different occasions, we are certain that it is this condition, and not the far more serious membranous (diphtheritic) laryngitis, which has been present.

Etiology.—Laryngeal catarrh occurs primarily as the result of cold and of the inhalation of irritating vapours. It also arises secondarily in the early stages of measles, in influenza, &c. The clinical variety which is here under consideration is seen, for the most part, in children between the first and third years. It may occur in somewhat younger infants and, though very liable indeed to recur, generally disappears spontaneously about the fourth year, but occasionally continues until the seventh or ninth. Some families are very liable to pseudo-croup.

Symptoms.—Pseudo-croup is generally preceded by an attack of coryza and sore throat. The child is, however, comparatively well during the day, and goes to sleep as usual at night. In a few hours it wakens up in very considerable distress. The face is flushed, there is a good deal of restlessness, the pulse is quickened, the temperature a little raised, and the patient sweats freely. All this is explained by the existence of dyspnœa, sometimes amounting to orthopnœa, accompanied by a harsh croupy cough, coming on in paroxysms. The breathing is laboured and noisy, and the cry may be brassy. These symptoms are so alarming that a doctor is at once summoned, but when he arrives the child is usually sleeping quietly and displays no embarrassment of the respiration. A second or third attack may come on as the patient is watched, or may perhaps be excited by pressure on the larynx. Next morning the child is very much in its usual health, and though the same train of symptoms (though in less marked form) may recur on the ensuing night, subsequent attacks on the third night or later are decidedly uncommon. A little hoarseness and cough remain for a day or two, and, as the laryngeal catarrh subsides, bronchial catarrh almost always develops. In cases examined by the laryngoscope there has usually been found a sub-chordal laryngitis, the loose tissue below the chords being swollen and almost blocking the chink of the glottis. The attacks occur at night because then the catarrh and swelling become worse, and the mucous membrane is dry and irritable. There is apparently a good deal of reflex spasm.

The **prognosis** is favourable, but there is a great tendency to recurrence. In a few cases fatal suffocation has ensued in weakly children during the paroxysms; in others true membranous croup has succeeded false croup. These contingencies are so rare that they may be disregarded. The **diagnosis** is easy. The history, the absence of the features of laryngismus, and the rapid subsidence of the stridor, enable us to distinguish this from other diseases with laryngeal stenosis.

The **treatment** need not be active. Warm fomentations to the neck are useful, and a little ipecacuanha wine may be given. Acetate of ammonia and bromides are also of value. The air of the room should be moist, the throat may be sprayed with a ½ per cent. solution of an alkaline carbonate, and warm drinks given freely. When the spasm is severe, emetics are useful. The best preventive measure is to protect the child from cold. Rational attempts to harden the patient may be advised—cool douches about the face and neck, the avoidance of too many wraps, and the like.

OTHER INFLAMMATIONS OF THE LARYNX AND TRACHEA—TUMOURS, &C.

In some patients every slight cold gives rise to a more or less harsh croupy cough. When we find this, and when no auscultatory signs of bronchitis are present, we may suspect that there is a catarrh of the larger tubes. Such a condition is extremely common. It is well to keep the patient in bed until all trace of croupiness is gone. It seems probable that the cases described by older writers as beginning in this way and proceeding to a **fibrinous laryngitis** with no trace of membrane in the pharynx, were, despite the absence of this, really cases of primary laryngeal diphtheria. It is true that there is no pathological impossibility in the occurrence of a non-diphtheritic membrane in the larynx, and instances have been described where it seems to have been present. Still, for all practical purposes, when a child develops the symptoms of laryngeal obstruction, as described in the article on diphtheria, and when a false membrane is found, the case should be regarded as one of diphtheria unless direct evidence to the contrary is produced.

Œdema of the glottis may occur in severe inflammations about the throat, in scalds of the mouth, as in burns from the steam of a kettle, &c. Here the symptoms of laryngeal obstruction are well marked, and set in suddenly; the swelling of the glottis may be detected by the finger. **Syphilitic laryngeal catarrh** shows itself by the hoarse cry of the congenitally syphilitic infant. In older children deeper ulceration and cicatricial stenosis of the glottis have been observed.

The only laryngeal tumour at all frequent in childhood is the **papilloma.** Foreign bodies may easily gain entrance to the larynx.

BRONCHITIS.

Etiology.—Exposure to damp and cold is undoubtedly the most frequent exciting cause of this very common disease, but it is a well-recognised fact that bronchitis is more liable to occur at the periods of dentition than at other times. Hence, although too much importance was formerly attached to teething as influencing the occurrence of this disease, an increased susceptibility (possibly of a reflex nature) must be admitted. Rachitic and ill-nourished children are far more liable to bronchial catarrh than healthy infants, and in them the condition is very apt to become chronic. Bronchitis is also a very frequent accompaniment of many of the infectious diseases, particularly of measles, whooping-cough, typhoid, and influenza; indeed, in few cases of the first two is it entirely absent. Gastro-intestinal catarrh and bronchitis are very often associated, but whether one is primary and the other secondary, or whether both are due to the same cause, it is usually difficult to say.

Morbid Anatomy.—The chief points of difference between the bronchitis of childhood and that of adult life are (1) its greater tendency to spread to the smaller bronchi and eventually to give rise to pneumonia and atelectasis, and (2) the frequency with which enlargement of the bronchial glands results.

Symptoms.—These may vary within very wide limits: in mild cases there is practically no symptom beyond a troublesome cough; in cases of inflammation of the smaller bronchi the patient is often very seriously ill.

The cough is the most common symptom; it is frequent and troublesome, but in young children, the sputum being swallowed, there is no expectoration. When the cough is harsh and dry it is accompanied by pain in the chest. It may be of a somewhat spasmodic character (resembling whooping-cough), and even be followed by vomiting; the vomited matters usually contain a large quantity of mucus. Coughing is generally set up when the child begins to cry. The respiration is nearly always more or less hurried; 30 or 40 respirations are common in mild cases, and, when the smaller bronchi are affected, they usually reach 60, 80, or even more, in the minute. A grunting expiration is common. The pulse is also increased in rapidity, but not proportionately to the breathing. Breathlessness on taking the breast, the nipple being dropped after one or two efforts to suck, inability to hold the breath for any length of time while being examined, and a certain amount of cyanosis, are present in severe cases of bronchitis, just as they are in broncho-pneumonia. The disease is often associated with vomiting and diarrhœa, but at times the alimentary canal remains perfectly normal.

Physical Signs.—A certain amount of in-drawing of the lower costal, episternal, and supraclavicular regions is found; the smaller the bronchi affected the more marked is this sign, and in mild cases it is altogether absent. There is no alteration of the percussion note. On auscultation considerable information may be got from the cry and the type of breathing. Normally, the majority of infants begin to cry when the stethoscope is applied, and if the cry be sustained for some time we are certain that no serious obstruction to the entrance of air exists. So, too, if the child holds its breath, as a healthy infant does, between inspiration and expiration, we know that there cannot be much bronchitis. The breath-sounds are normal, but may be obscured by the accompanying rhonchi, snoring or sibilant, according as the catarrh has involved the larger or the finer bronchi. At a later stage there are also crepitations, fine or coarse as the case may be. In bad cases, where the smaller bronchi are affected, high pitched sibilant rhonchi are usually heard over the whole chest; in slighter cases the accompaniments are more localised.

Course.—The course of the disease varies very greatly. In healthy children who are well cared for, complete recovery may ensue in the course of a week or two. In weaker or neglected children there is great tendency to recurrence; indeed, this is seen in almost all cases, to some extent at least. Such recurrent bronchitis often appears at each eruption of new teeth, and on every occasion of exposure to wet or cold. The risk of the catarrh spreading to the smallest bronchi is always present. The dangers of such a condition are (1) extreme swelling of the mucous membrane with cyanosis and asphyxia—suffocative bronchitis; (2) the occurrence of catarrhal pneumonia and collapse of the lung. Severe cases are known as "capillary bronchitis," but, as in nearly all of them broncho-pneumonia is found *post mortem*, the tendency in recent years has been to discard the term. The predisposition to pulmonary collapse and pneumonia is greatest in anæmic, ill-nourished, and particularly in rickety children, in whom the chest walls are soft and yielding.

Henoch has drawn attention to a form of bronchitis commencing in the first weeks of life, probably as the result of exposure to cold. In it there is a rattle in the throat very alarming to the parents; when the child coughs once or twice this disappears, only, however, to return in a little time. Though not dangerous, the condition is but little amenable to treatment.

Prognosis.—Except in slight cases the prognosis should be guarded, and in very young, weakly, or neglected children, or when signs of implication of the finer bronchi develop, it is unfavourable. The respirations are a much safer guide in forming an opinion than the pulse, as the risk of asphyxia is greater than that of heart-failure.

The **diagnosis** is extremely easy. The great difficulty is to know, in a case of inflammation of the finer bronchi, when pneumonia supervenes. In the absence of physical signs, increase in the respirations, in the cyanosis, in the dyspnœa, and in the temperature, are the most important symptoms. Pulmonary collapse is usually attended by similar symptoms, but here the temperature generally falls.

Treatment.—The air of the sick-room should be moistened by steam, and kept at a temperature of 68° to 72° Fahr. The child requires plenty of liquid food, and occasional sips of water should be given. The patient should not be constantly in bed, but should be carried about in the nurse's arms, and crying should be encouraged in moderation, as by these means the lungs are expanded and the risk of atelectasis is lessened. In most cases it is well to begin treatment by giving a calomel purge. Then expectorants tending to render the mucus less viscid, such as bicarbonate of soda, ipecacuanha, &c., may be ordered, and, if the temperature be somewhat high, acetate of potash, spirit of nitrous ether, or Mindererus spirit should be added. All depressant remedies are, however, contra-indicated in weakly children. Later, when the secretion becomes free and the cough less painful, stimulant expectorants such as aromatic spirit of ammonia and carbonate of ammonium should be substituted. When the cough is very hard and irritating a few drops of aqua laurocerasi, or of the syrup of Virginian prunes, may be given along with the other drugs mentioned. Bromide of ammonium, or syrup of chloral, is occasionally useful, but codeia and morphia are better avoided.

Local applications are frequently of value. The chest should always be wrapped in a sheet of wool or gamgee tissue, and a stimulating liniment, such as the compound camphor liniment or turpentine liniment, may be rubbed on. In more severe cases poultices are needed. We may order constant jacket, or intermittent poulticing; in the latter case a little mustard should be added. The poultices should be put chiefly on the back of the chest, and, if desired on the front, care should be taken that they are so light as not to embarrass the breathing. Jacket poultices require to be changed as soon as they grow cold—in from two to two and a half hours.

When the breathing grows shallow and there is fear of pulmonary collapse, wrapping the child in a wet sheet and covering with blankets, the procedure being repeated every hour for half a day or so, has often a very beneficial effect. The breathing is stimulated and the air vesicles are distended when the pack is first applied, and later an action like that of a poultice is produced. If this be insufficient to maintain the respiration the child may be placed in a warm bath and cold affusion tried. In such cases, stimulants must always be previously given. In cases of suffocative bronchitis, where the smaller bronchi are becoming filled with mucus and the respiratory movements are unequal to drawing air into the chest, the greatest benefit may be got from faradisation of the thorax and diaphragm. Deep inspirations are caused, and cyanosis may rapidly disappear. To be effectual the application must be repeated as soon as the breathing again becomes shallow. Cardiac stimulants are not usually required, but digitalis may at times be useful. Of general stimulants alcohol and strychnine are the best; atropine is sometimes recommended.

The general health of the patient requires careful attention as soon as the acute stage is past; anæmia and rickets must receive appropriate treatment, as bronchitis is much more liable to recur when they are present. Between the attacks the child will be the better for getting plenty of fresh air if the weather be mild, and this, along with cod-liver oil and petroleum emulsion, is the best means of preventing recurrence.

PNEUMONIA.

Pathogenesis and Morbid Anatomy.—While pneumonias of childhood fall into two great groups—the catarrhal or lobular (broncho-pneumonia) and the fibrinous or lobar (croupous pneumonia)

—the distinction between these is now seen to be less hard and fast than was formerly believed to be the case. Indeed, some would go the length of saying that the occurrence of one or other form is rather explicable by physical differences in the child's lung than by any essential peculiarity in the pathological process. Although most cases of croupous pneumonia are due to the diplococcus of Frænkel or the pneumococcus of Friedlænder, these organisms are found in certain cases of catarrhal pneumonia; conversely, croupous pneumonia may be due to organisms other than those specified—to the staphylococcus and streptococcus, which are the common exciting causes of catarrhal pneumonia. It therefore appears that the organism alone is insufficient to explain why in one case a catarrhal, in another a fibrinous, pneumonia is set up. It is fully recognised that on the whole the former is the more common variety; and this is especially so in children below the age of two years, in whom croupous pneumonia is comparatively rare. In children over that age it is, however, very commonly seen. It has been suggested that certain anatomical peculiarities in the lungs of young infants—the larger calibre of the air-passages, the greater vascularity of the alveolar walls, and the large size of the epithelial cells lining the alveoli—may conduce to the occurrence of a catarrhal rather than a fibrinous inflammation. Be this as it may, it seems probable that the exact nature of the process set up is determined by the reaction of the organism as well as by the exciting germ. In a family which came under our notice, four members, three of whom were children, became affected with croupous pneumonia. The patients fell ill at intervals of from twelve to thirteen days; in all four cases the pneumonia was localised in the right upper lobe; and the crisis occurred on the eighth day. It is impossible to escape the conclusion that, from some inherent peculiarity of structure, this particular part of the lung became affected; and it is further of some interest to note that a strong family likeness of feature was present in all the patients. The cases will at least serve to show that the character of a pneumonia may be very considerably dependent on the constitutional idiosyncrasy of the patient as well as on the exciting organism.

To return to the comparison of the catarrhal with the croupous form of pneumonia. Clinically, it is sometimes impossible to say with which form we are dealing. We may, for instance, have a case whose onset is sudden and whose physical signs and temperature are compatible with the existence of a croupous inflammation; then the course changes and signs of catarrhal pneumonia develop. Moreover, pathological evidence conclusively shows that fibrinous and catarrhal pneumonia may coexist. In typical instances, and these include the great majority of cases, the clinical distinction is easy and the morbid changes characteristic. Catarrhal inflammation is characterised by lobular foci of consolidation, which consists mainly of catarrhal products with a certain amount of fibrin intermingled. These foci may be isolated or diffused through the lung. When a number coalesce a whole lobe may become consolidated and the lobular type of inflammation be lost. There is always some bronchitis, and when the areas of inflammation are superficial there is some plastic exudation on the pleura. The resulting change is usually absorption; but sometimes caseation (when tubercle is implanted), abscess formation, interstitial pneumonia, or gangrene may result. In croupous pneumonia the stages of congestion, red hepatisation, and grey hepatisation, are seen as in the adult. The inflammatory products consist mainly of fibrinous exudation into the alveoli. One peculiarity practically limited to childhood must be noted: the frequent occurrence of empyema. The apex of the lung is often affected; a lobular form of croupous pneumonia may occur. As has been mentioned, mixed forms of pneumonia are often found.

In the preceding paragraphs it has been our object to point out features of similarity between, as well as to contrast, these two groups of cases. The reader must, however, understand that, clinically, the vast majority of cases are perfectly distinct both as regards onset, course, signs, and gravity. It is only because they are so often entirely dissociated that it seems advisable to indicate some limits of their separation from each other.

CROUPOUS PNEUMONIA.

This is most frequently met with in children over three, but even before this age it is commonly enough seen. During the first two years of life it is, however, much less common than catarrhal pneumonia.

The **etiology** is much the same as in later life. Pneumonia usually follows exposure to wet or cold, and may for some time be preceded by bronchitis; it occasionally assumes the form of an epidemic.

Symptoms.—The onset is sudden; there may have been some previous bronchitis, but this as a rule has not been of any severity. The patient rapidly becomes very ill, vomits, and may even be seized by convulsions. The temperature rises to 103° or 105° Fahr. or thereabout; it remains high, but has a greater tendency to remit than in the adult. The respiration becomes rapid, 60 to 80 or even more, whilst the pulse rises to 120 or 160, the pulse-respiration ratio being therefore about 1 : 2½ or 2. In most cases the pulse-tension remains fairly good. There may be a short, suppressed, and painful cough, but, in many cases, its slightness is somewhat striking. Before the age of five or six there is seldom any expectoration, the sputum being swallowed. In later childhood the sputum has the usual rusty, viscid character. The patient's face is flushed, and occasionally (though not very commonly) may be rather cyanosed; herpes of the lips is often present. The child usually lies on the affected side, over which, from the accompanying pleurisy, there is often some tenderness. The pain, especially towards the beginning of the illness, is, however, often referred to the epigastrium. The lips are dry and cracked and the tongue furred; diarrhœa is rare.

The urine is scanty and the chlorides diminished ; there may be a little albuminuria. Delirium at night is not uncommon, and is seen as frequently in the basal as in the apical forms of pneumonia.

Physical Signs.—We find dulness, at times preceded by a tympanitic note, over the affected area ; at first fine crepitations, then broncho-vesicular passing to tubular breath-sounds, with bronchophony ; succeeding these are broncho-vesicular and then vesicular breathing, with coarse redux crepitations. The signs of pneumonia are, however, very often latent. They must be searched for daily in suspected cases, and may be so short-lived as even then to escape detection.

Course and Progress.—The disease usually lasts for from five to eight days, and ends by crisis. In children, however, there are frequently slight fluctuations of temperature after the crisis ; these should disappear in two or three days, after which the temperature as a rule remains slightly subnormal for a time. We very commonly find that, on the night after the crisis, the temperature is as high as it was on the preceding evening ; after this it remains normal. Immediately after the crisis the patient is very well and recovers rapidly. Should the temperature rise after having remained subnormal for a day or two, some complication should be suspected ; there may be another focus of pneumonia, or, what is also common, an empyema. In certain cases the disease lasts some days longer than usual ; these always give rise to a certain amount of anxiety.

Varieties.—(1) It is not uncommon to meet with cases which show all the symptoms of croupous pneumonia, and yet, on physical examination, give no signs of consolidation. In most of these the signs appear in a few days, but in some it is not for several days, or even until after the crisis, that the physical signs of the condition are apparent. (2) In other cases we find symptoms like those of a commencing pneumonia, and, at one part of the chest, a few fine crepitations with or without a somewhat blowing character of the breath-sounds, and a little dulness on percussion. These signs disappear suddenly in a day or two, the temperature falls abruptly, and recovery is rapid. In some of these "abortive" cases of pneumonia it is probable that no signs whatever show themselves, though the symptoms for a day or two suggest the disease. (3) Very serious cases, fatal on the first or second day, are sometimes seen, and the *post-mortem* may reveal complete grey hepatisation. (4) To the form of the disease where the inflammation spreads irregularly from one lobe to another, the name of "wandering pneumonia" is given. (5) Other clinical types are described—cerebral, typhoid, gastric, &c.—according to the nature of their symptoms.

Complications.—Pleurisy is practically always present, and should be regarded as a part of the disease. Pericarditis sometimes occurs, especially when the pneumonia is a left-sided one. Empyema is the most frequent complication ; meningitis, nephritis, abscess of the lung, gangrene, chronic interstitial pneumonia, and phthisis, are all rare.

Diagnosis.—This is, as a rule, easy. Sometimes, however, there are no symptoms except a high temperature and rapid respiration; and when such is the case, a most minute examination of the chest must be made. The physical signs are frequently delayed, and can often be first detected on auscultation high up in the axilla. One must not be deceived by the somewhat tympanitic note which may precede the dulness; in such cases auscultation will furnish sufficient signs. At the very onset of the disease the high temperature, vomiting, and convulsions may simulate some cerebral mischief, but the disturbed pulse-respiration ratio will usually suggest a pulmonary lesion. In some cases, where the onset has been less marked than usual, it may be difficult to diagnose between a broncho-pneumonia with extensive consolidation, and a croupous pneumonia; the points of distinction will be mentioned in treating of broncho-pneumonia. When empyema follows there is usually more marked dulness, with deficient vocal fremitus, distant bronchial breathing, and nasal resonance. In many instances, however, even where there is a fairly large amount of fluid, the distinctness of the breath-sounds and vocal resonance is remarkable; we therefore trust more to percussion and to palpation than to auscultation. On the other hand, a thickened pleura gives rise to the same signs as an effusion; hence, in every case presenting the least difficulty, a large-sized exploring needle should be used.

The **prognosis** in the croupous pneumonia of childhood is very much more favourable than in the adult, and incomparably better than that of broncho-pneumonia. Heart-failure is not to be dreaded unless there be a complicating endo- or pericarditis. Most of the deaths which occur are caused by general systemic poisoning, and in these the nervous symptoms are usually very marked. In a smaller number of cases the development of empyema is the cause of death.

Treatment.—The patient requires a room of equable temperature, abundance of fresh air, and plenty of nourishing fluid diet, as well as an occasional drink of water to allay thirst. The chest should be covered with a pneumonia jacket of wool or gamgee tissue. At the beginning of the illness a mercurial purge is advisable, and during its course a diaphoretic and febrifuge mixture. In most cases this is all that is required, but occasionally digitalis and stimulants are also needed. If the temperature run very high, a cold pack, sponging, or, if necessary, a cold bath, may be tried. For sleeplessness, cold sponging is usually all the treatment required; sulphonal, paraldehyde, or chloral may also be given; the last-named has been strongly recommended on the ground that it not only gives sleep, but shortens the duration of the disease. It should be combined with digitalis or some such cardiac stimulant. After the crisis, if the chest be not clearing up so rapidly as we should like, iodine or flying blisters may be applied.

BRONCHO-PNEUMONIA—CATARRHAL OR LOBULAR PNEUMONIA.

This is a very common and important disease of early childhood. Of all cases of inflammation of the lungs occurring before the third year of life, about three-fourths are broncho-pneumonia, and only one-fourth croupous pneumonia. From the third year onwards the former becomes much less common and the latter much more so.

Etiology.—Broncho-pneumonia may be acute, subacute, or chronic. It is usually secondary to some other disease, and generally follows bronchitis, whether primary, or—as is often the case—secondary to one of the eruptive fevers or whooping-cough. Broncho-pneumonia also (though less frequently) follows diphtheria, typhoid, &c. It may also be due to inhalation of septic material from the mouth, nose, pharynx, or larynx—*e.g.*, after operations on these parts, ulcers, noma, &c.; and cases of this "aspiration pneumonia" occur, during the first days of life, from the drawing into the lungs of fluids in the earliest respiratory efforts. Broncho-pneumonia is much commoner in winter and spring than in summer, and is most prevalent in changeable weather. Bad hygienic surroundings, and want of care in clothing and diet, are strong predisposing factors, as are also gastro-intestinal disturbances and rickets.

Symptoms.—As in the greater number of instances the disease follows bronchitis, whether primary or symptomatic, its onset is usually rather indefinite, the symptoms being masked by those already present. In some cases of measles, however, the pneumonia does not supervene in the early stage of great catarrh of the respiratory tract, but is delayed until a later period when the bronchial catarrh has nearly disappeared, and has thus a more definite onset.

The symptoms of bronchitis become aggravated. The dyspnœa and the rapidity of respiration increase, the alæ nasi move, and the indrawing of the lower ribs, the episternal notch, and the supraclavicular fossæ becomes very marked. Cyanosis appears, and may be extreme; the pulse becomes rapid, and is usually small; the temperature rises, and remains higher than before. All these—but especially the rising temperature, the rapid breathing, and the increased dyspnœa—are very suggestive of the onset of catarrhal pneumonia. The temperature usually reaches 103° or 105° Fahr., or even higher, and is remittent in type. It continues for a considerable time, and only gradually falls to normal by lysis; hyperpyrexia may supervene. The respirations are very rapid, from 60 to 100 per minute, bearing therefore a ratio to the pulse of about 1 : 2. They are shallow, and accompanied by a short expiratory grunt. It is noticed, on beginning to auscultate the child, that the latter is too dyspnœic to hold its breath for any length of time, that it cannot suck properly—after one or two attempts it allows the nipple to fall out of the mouth, and that it cannot give a long cry. These symptoms are also seen in inflammation of the smaller bronchi, but are intensified when broncho-pneumonia develops.

The cough is troublesome, and that it is painful is evidenced by a short cry or by facial contortions. As the sputum is nearly always swallowed, there is seldom any expectoration; but if the child be laid on its face, a considerable amount of frothy secretion may be expelled during coughing. Cyanosis is usually a fairly prominent feature, and gives the patient a very different aspect from that of a typical case of croupous pneumonia. The pulse runs up to 120, 140, or 180, as the case may be; it is weak, and towards the end of a bad case, irregular. The child usually lies quite inattentive to its surroundings, its whole energy being required in the act of respiration. Nervous symptoms are not common at the beginning of the disease; later, the child becomes torpid, and eventually coma and convulsions may supervene. When the patient is comatose or semi-comatose, Cheyne-Stokes' breathing is likely to develop. Recovery may ensue after these nervous symptoms have set in. Sometimes they are due to a true meningitis, but in the absence of definite localising symptoms a diagnosis is scarcely possible.

Physical Signs.—There are three main varieties of the disease. In the first the signs are those of an acute bronchitis of the smaller tubes, with rhonchi and râles all over the chest, but without any alteration in the breath-sounds, or dulness on percussion. Occasionally a few sharp crepitations may be heard at the very end of inspiration in addition to the ordinary accompaniments of bronchitis. The diagnosis rests on the high temperature, the dyspnœa, and the serious condition of the patient. The second variety is the common one. In it small patches are found, over both lungs, where the breath-sounds are of a blowing, even tubular character, and are accompanied by crepitations and increased vocal resonance. There may be slight dulness at these points, but, as a rule, it is masked by the hyper-resonant note given by the surrounding emphysema. Other small areas with deficient breath-sounds may also be discovered; these are due to patches of collapse following plugging of the bronchi. The patches of pneumonia are often most marked near the bases and vertebral margins of the lungs, but in all suspicious cases the whole chest must be carefully gone over, whereupon, not infrequently, small consolidated areas will be found in the præcordial region, or at the extreme lower and anterior margin of the right lung. The outlines of these small areas can often be mapped out most satisfactorily by the character of the vocal resonance. In a third—much less common—variety there are one or more large areas of consolidation giving the ordinary physical signs. The dulness does not strictly coincide with the outline of a lobe; and, on careful examination, other patches are pretty sure to be found elsewhere.

Varieties, Course, and Progress.—As before stated, broncho-pneumonia is acute, subacute, or chronic. Acute cases, with a sudden onset like a croupous pneumonia, and lasting only a few days, are rare; more commonly the disease is subacute, having a duration of from two to three weeks. The temperature remits, and in favourable cases falls to normal by lysis, the pulse and respiration at the same time becoming slowed. In these cases relapses are common, and at each relapse more and more lung tissue is implicated. As in bronchitis, alarming symptoms may suddenly develop on account of collapse of a large area of lung—cyanosis, dyspnœa, and collapse being the most important. When subacute broncho-pneumonia ends fatally, asphyxia and exhaustion are usually the immediate cause of death. Occasionally the course is prolonged over months, fresh portions of lung becoming involved, and the temperature scarcely ever continuing at normal for more than a day or two. This is especially liable to happen in pneumonia following whooping-cough. Recovery may ultimately ensue, or signs of respiratory insufficiency may at length develop, the heart becoming feeble, the chest filling with râles, the cough ceasing, œdema setting in, and the patient dying of exhaustion. In some cases the disease is even more chronic ; there is scarcely any temperature, nor does the chronicity depend on the invasion of fresh areas of lung, but we simply find a patch of consolidation which persists for weeks or months, and in favourable cases eventually disappears. In these cases (which are often mistaken for phthisis) there may be troublesome cough, loss of appetite, breathlessness, and anæmia. Some of these chronic pneumonias begin acutely, others are chronic from the first.

The chief **complications** are collapse of the lung and emphysema ; pleurisy, more rarely empyema, tubercular infection, abscess and gangrene of the lung, and cirrhosis, may occur. Meningitis and gastro-intestinal catarrh are occasionally observed.

Diagnosis.—In most cases the diagnosis is easy. The remittent temperature, the rapid breathing, the dyspnœa and movement of the alæ nasi with inspiratory retraction of the chest, the cyanosis, and the patches of consolidation (if present), indicate the condition with sufficient clearness. Where no sign of consolidation is present, the diagnosis from a bronchitis of the smaller tubes depends chiefly on the gravity of the general symptoms. With a large area of consolidation it may be doubtful whether we are dealing with a croupous or a broncho-pneumonia. The onset of the former is usually more sudden, the temperature curve is less remittent, and there is generally a crisis ; the chlorides in the urine are diminished, the lesion is confined mainly to one lung, and the area of consolidation corresponds more or less closely with a lobe of the lung.

The diagnosis of a simple chronic, from a tubercular broncho-pneumonia, will depend mainly on the course. The probability is in favour of the disease being non-tubercular.

Prognosis.—Acute or subacute broncho-pneumonia is a very serious disease, and the younger the child the worse is the prognosis. Probably about 50 per cent. of such cases die, but the proportion is less among the well-to-do classes than among the poor. Broncho-pneumonia supervening in measles, or in whooping-cough, is especially fatal if the surroundings be bad. Rickets, increasing as it does the risk of atelectasis, makes the prognosis much worse. Cases which have persisted for months without much alteration may ultimately clear up; we cannot, therefore, diagnose phthisis, and give a correspondingly bad opinion, simply because a patch of pneumonia has existed for a considerable time.

Treatment.—As the condition nearly always supervenes in the course of bronchitis, children suffering from the latter must be carefully tended until they have completely recovered. When the disease has set in, the child's room should be kept at an equable temperature of about 70° Fahr. It is inadvisable to allow the patient to lie constantly; he should be moved from side to side and carried about in the nurse's arms. By doing this, coughing and breathing are aided, and secretion is prevented from accumulating at the bases of the lungs. The food must be light and nutritious, and the emunctories should be kept acting freely. To assist in the removal of the secretion and prevent plugging of the smaller bronchi, the air of the room should be kept moist by allowing the steam of a kettle to escape into it. If a bronchitis tent be used it ought to be large enough to permit of the patient getting plenty of fresh air. Poultices may be applied; as a rule, intermittent poulticing is best, the chest being wrapped in a pneumonia jacket in the intervals. At the beginning, small doses of alkalies with ipecacuanha are useful in rendering the secretion of mucus less tenacious; or, when the cough is troublesome, a mixture of equal parts of the syrups of chloral and tolu may be given in doses of 10 or 20 minims. In many cases a cough-mixture containing a little sal volatile and benzoate of ammonium in peppermint water is useful. Soon, however, stimulant expectorants are required; we may give $\frac{1}{6}$ to $\frac{1}{4}$ gr. of carbonate or chloride of ammonium every four hours to a child a year old. Tincture of digitalis, in doses of 1 min., may often be advantageously combined with this. To stimulate the failing heart, strychnine ($\frac{1}{300}$ to $\frac{1}{100}$ gr.) is useful, and in most cases it will also be necessary to give alcohol. The indication for its use will be found in the state of the pulse, and when any sign of flagging is noticed wine or brandy should be ordered. When the temperature is very high, cold packs or spongings are useful. These act much better than antipyretic drugs, of which the best are phenacetin and quinine. When the pulse is weak and the surface cold, although the internal temperature is high, a hot bath may reduce the temperature considerably. When nervous symptoms supervene, the application of cold will often dispel them.

In cases where the disease has lasted for some little time quinine should be given in fairly large doses. Iodine may be employed as a counter-irritant; blisters must only be applied with extreme caution, and are contra-indicated in weakly children, especially in convalescence from measles. After the temperature has fallen, tonics, cod-liver oil, and change of air are needed.

In chronic pneumonia the treatment is that of phthisis. The results are often surprisingly satisfactory.

INTERSTITIAL PNEUMONIA.

Etiology.—A fibroid change in the lung (cirrhosis) may result from chronic pneumonia or bronchitis, or from pleurisy. In a considerable number of cases it is tubercular from the first, and if not so may readily become infected later. It is not infrequently accompanied by bronchiectasis.

Symptoms.—The patient is pale, emaciated, and breathless, but there is seldom fever unless bronchitis has supervened or tubercular infection is present. The cough varies; in some cases it is slight, but, where bronchiectasis is marked, it is very troublesome and is attended by copious fœtid expectoration.

Physical Signs.—There is usually unilateral retraction of the chest, either general or most marked at the apex or base, and with this there is almost always displacement of neighbouring structures. Compensatory emphysema of the opposite lung, and of the unaltered parts of the affected lung, commonly obscures the changes to some extent. The signs of consolidation, and at times those of cavity formation, are also present.

Course and Prognosis.—The course is very chronic. There is little tendency to recovery, but rather a slow advance with each successive attack of bronchitis. The chief dangers are—acute pulmonary complications, phthisis, and dilatation of the right side of the heart.

The **diagnosis** rests on the physical signs, especially the retraction of the chest, and on the chronicity of the course.

Treatment.—As the lesion is permanent and irremediable, all that can be done is to protect the patient from catarrhs, &c., which will further advance the disease. Hence the cough should be treated by stimulating expectorants, or, if bronchiectasis be present, by inhalations or intra-tracheal injections of creasote, eucalyptus, terebene, &c. The treatment, in fact, is that of phthisis.

EMPHYSEMA.

A certain amount of hyperdistension of some of the air vesicles is common in the lungs of children, especially in bronchitis, bronchopneumonia, atelectasis, and other conditions where, owing to local collapse, surrounding emphysema occurs. Thus it is that in pneumonia there is frequently a hyper-resonant rather than a dull note, and thus a concealment of the consolidated areas. In rickets also, it is usual to find, near the margins of the lungs, a slight amount of pulmonary collapse, and emphysema of the contiguous parts. This condition of compensatory emphysema is only temporary, and disappears as the primary lesion improves. And, pathologically, there is not that destruction of the alveolar walls which characterises true emphysema. In other conditions a permanent compensatory emphysema develops. This is the case in cirrhosis of the lung, where it is common to find both the healthy organ, and the unaffected part of the diseased one, in a state of emphysema. A similar change may also occur around localised tubercular patches.

Although rare, true emphysema is also seen, particularly in older children. It results most commonly from whooping-cough, bronchitis, and asthma, especially the first; and it is possible that rickets predisposes to it by lessening the resisting power of the lung. Indeed, very bad cases traceable to whooping-cough in childhood are occasionally seen, in which, with the slightest bronchial catarrh, the patient becomes very breathless and cyanosed. In most cases, however, there is little backward pressure on the right heart, and the chief signs of emphysema are an abnormally rounded shape of the chest, hyper-resonance on percussion, and diminution in the size of the superficial cardiac dulness. When there is rickety deformity the characteristic shape of the chest may be absent, but even in this case the rounded shoulders of emphysema are sometimes seen.

Course and Prognosis.—Emphysema rarely gives rise to much discomfort. Nevertheless, it may lay the foundation of serious results in after-life, and, as has already been said, we occasionally see a case in which the suffering is considerable. Therefore, although the temporary emphysema, which can sometimes be made out quite clearly in cases of bronchitis and whooping-cough, generally passes away, we must remember that this is not always so.

Treatment.—Every day by which the duration of a cough is lessened is something gained in the prevention of emphysema. After the disease has developed we can only protect the patient from exposure to cold and wet, treat the bronchitis carefully as it supervenes, and relieve the work of the right heart as much as possible.

ATELECTASIS.

Etiology.—Pulmonary atelectasis is either congenital or acquired; the former of these has been already dealt with. Acquired atelectasis is due to the failure of air to enter the alveoli in certain parts of the lung. It is nearly always produced by the blocking of a bronchiole by a plug of mucus, as occurs in bronchitis. The result is the absorption of the air which has entered by that bronchus, and the collapse of the alveolar wall. Where the cough is frequent, as in whooping-cough, a plug of mucus may act as a ball-valve, allowing the expulsion of air with the cough, but preventing its entrance during inspiration. Collapse of the lung is also common in bronchopneumonia. In addition to catarrh of the bronchi, the most important factors in the causation of the condition are weak inspiratory movements and diminished intra-thoracic capacity. Both of these are present in rickets, hence rickety children are especially liable to atelectasis; but inanition, anæmia, and other forms of malnutrition, also predispose to it. Young infants are much more liable to atelectasis than are older children.

Morbid Anatomy.—The patches of collapse are usually small, are most often situated about the lower and posterior margins, and at the anterior borders, especially at the lingula on the left side. Occasionally they coalesce to form areas of considerable size.

The **symptoms** are usually obscure. Hurried shallow respiration, cyanosis, a rapid and weak pulse, and (where bronchitis is present) cough, are the chief. The child looks weak and exhausted, and is often dull or semi-comatose; the temperature is subnormal unless some inflammatory complication be present. On physical examination inspiratory retraction of the less supported parts of the chest is seen. Areas of dulness may be found, but the impairment produced by the collapse is often obscured by the surrounding emphysema, and frequently enough the patches are too small to give any alteration in the percussion note. On auscultation we may find either distant or bronchial breathing, depending on whether or not the collapsed lung is lying in relation to a large bronchus. These signs should be sought for chiefly at the borders of the lungs.

Prognosis.—The prognosis is bad in cases where the areas are large enough to be distinguishable by physical examination. The disease is, however, by no means always fatal.

Diagnosis.—It is often impossible to say when collapse supervenes in the course of bronchitis, because, as we have seen, the signs are often obscured. If cyanosis come on rapidly with a fall in temperature, there is usually some atelectasis. The occurrence of a broncho-pneumonia may be distinguished from that of a large area of collapse by the temperature.

Treatment.—Care in the treatment of bronchitis, particularly when the patient is rickety or weakly, will help to ward off collapse of the lung. When it supervenes the child must have plenty of nourishing food, and stimulants must be freely given. Besides alcohol, ammonium carbonate, camphor, &c., are the most useful. Treatment must also be directed against the collapse itself; in order to assist in the inflation of the lungs the cold pack, or even the cold bath, may be used. The patient should not be allowed to remain too long in one position, and crying as well as coughing is to be encouraged.

ENLARGED BRONCHIAL GLANDS.

Enlarged bronchial glands are found in a large proportion of all *post-mortem* examinations on children. In most cases the condition seems to result primarily from a bronchial catarrh; and if this be prolonged, or if it recur, the enlargement persists and is extremely likely to become infected with tubercle. We may, therefore, have a simple enlargement, or caseation; and pressure on a bronchus, with more or less obstruction of the lumen, on the vessels in the thorax, or on the vagi, may result. The glands may soften, and burst into the œsophagus, the pleura, the air-passages, or the veins of the lung. Rupture into a vein can frequently be demonstrated in cases of miliary tuberculosis; but apart from this, caseating bronchial glands often form the starting-point of phthisis, the tubercular process extending from them by contiguity.

Symptoms.—Many and varied are the symptoms which have been ascribed to enlargement of the bronchial glands. The fact remains that, in most cases where they have been found *post-mortem*, no symptoms whatever appear to have been produced. In others, however, they have been accompanied by symptoms. Thus a prolonged spasmodic cough, not unlike that of pertussis, and at times resembling it even in the inspiratory stridor at the end of each attack, may be present; stridor with retraction of the chest walls has occurred, and has been so marked as to lead to the performance of tracheotomy on the supposition that some intra-laryngeal obstruction was present. In both these conditions the voice is normal, not stridulous as in laryngeal stenosis. Asthma has been found associated with enlarged bronchial glands. All these are, no doubt, reflex in character, and may possibly be due to the implication of the vagi. When the glands actually press on the bronchi there may be a harsh metallic cough. The patient is usually somewhat ill-nourished and anæmic, and there may be a slight rise of temperature. The veins of the neck may be engorged.

In most cases no physical signs of the disease can be made out. Occasionally, when a large bronchus is compressed, there may be defective expansion of a part of a lung, with impaired percussion, diminution of the fremitus, resonance, and breath-sounds, and perhaps stridor. The glands are generally too deep to give, by themselves, any change in the percussion note; hence it is rare to find any abnormal dulness over the upper part of the chest anteriorly; occasionally some impairment may be present in the interscapular space.

Eustace Smith draws attention to a sign to which he ascribes some importance. If the stethoscope be applied over the middle of the upper part of the chest, and the head of the child be then bent back until the face is directed upwards, a soft continuous hum may be heard; as the head is moved forwards it again disappears. This is attributed to the pressure of the glands, which in this position are pushed against and compress the large veins of the chest.

The sudden expectoration of a quantity of pus is suggestive of the rupture of a bronchial gland into the trachea.

The **treatment**—fresh air, nourishing food, cod-liver oil, iron, and creasote—is that of tubercle elsewhere.

PULMONARY TUBERCULOSIS.

In children over six or seven years the characters of phthisis are in no way different from those of the disease in the adult. Before this age, however, it deviates from that type, and the younger the child the greater is the divergence.

The **etiology** of phthisis in the young need not be referred to at any great length. There is always a much greater tendency for a generalised tuberculosis to take place in the child than in the adult. An hereditary predisposition to tubercular infection may manifest itself by the scrofulous or strumous diathesis. Tuberculosis is liable to become engrafted upon a chronic bronchitis; it may succeed measles, whooping-cough, or broncho-pneumonia; a broncho-pneumonia may also be tubercular from the first. In most cases, tubercular infection of the lungs follows tuberculosis of the bronchial glands, for although the mesenteric glands are, doubtless, occasionally primarily involved, the organism, as a rule, gains entrance by the breath rather than by the food. In recent times some attention has been paid to the occurrence of tubercular infection of adenoids and enlarged tonsils, and it seems probable that the organism may, not infrequently, gain entrance by these structures. Phthisis would also seem at times to follow a pleurisy.

Symptoms.—The important point to be remembered is that, in the case of infants and young children, the general disturbance of nutrition is much more manifest than the symptoms arising directly from the local lesion. And it follows that, even where local signs are evident, the tubercular process is usually much more widely spread than these would lead us to suppose. In children dying of phthisis, we usually find that not only the lungs, but also the whole of the other viscera, are riddled by tubercular deposits—by miliary tubercle or by chronic caseous masses. In dealing with phthisis one is therefore rather discussing the whole subject of tuberculosis.

The disease shows itself in several distinct varieties:—

(1) CHRONIC CASEATING TUBERCULOSIS IN INFANCY.

In young infants the clinical picture of marasmus, with emaciation, diarrhœa, harsh rough skin, slight pigmentation, and enlargement of the superficial glands, presents itself; and often no definite sign of local disease can be detected during life, although, at the *post mortem*, caseating nodules are found in the lungs and other viscera. Hence the diagnosis rests on a very insecure basis. A marked hereditary predisposition to tuberculosis, the signs of pulmonary consolidation, or the presence of definite external tubercular lesions, are the chief points on which an opinion can be formed. In these cases the temperature is rarely elevated.

(2) BRONCHO-PNEUMONIA WITH SECONDARY TUBERCULOSIS.

In this class of patients the tubercular infection is superadded to a pre-existent broncho-pneumonia. The fever remains, the physical signs wander from lobe to lobe; the patient emaciates rapidly and suffers from hectic; signs of breaking down of the lung may develop, and death eventually takes place from exhaustion or a complication. Tubercular disease of the bowel may occur, and a tubercular meningitis is a very common termination to this, as it also is to the preceding, variety. The diagnosis of these cases (which may be fairly acute or more chronic) rests mainly upon the general signs of tuberculosis. The diagnosis of cavity-formation is difficult because the signs are simulated so closely by those of marked consolidation with catarrh. The most reliable evidence is the presence of coarse bubbling râles. The student must not expect to find that the apices are most affected : the lower lobes are quite as frequently the seat of a tubercular deposit. On the other hand, a chronic pneumonia may easily be regarded as tubercular by one who is familiar with the lung conditions in the adult alone ; here the course and constitutional disturbance are our chief guides. Empyema in young children is sometimes attended with extreme emaciation and fever, and closely resembles phthisis until an exploration of the chest reveals the presence of pus.

(3) Latent Tuberculosis of Older Children.

In this case the patient is brought for medical advice on account of loss of appetite, digestive disorder, and emaciation. In these circumstances the chest must be thoroughly overhauled. At first nothing may be found, but sooner or later a few sharp crepitations with signs of catarrhal pneumonia develop, and, often, tubercular manifestations in other viscera as well. The temperature-curve of such cases is more or less irregular and characteristically tubercular.

(4) Miliary Tuberculosis.

The general signs and symptoms of acute miliary tuberculosis are much the same as in the adult. We may have chiefly typhoid symptoms, or the signs of capillary bronchitis may be well marked. The diagnosis is a matter of great difficulty. The disease may end in ten days or a fortnight from its commencement ; or it may be subacute or chronic and run a longer course.

(5) Chronic Phthisis (Adult Type).

In older children—over the age of five or six—phthisis of the adult type may occur : as ordinary tubercular consolidation and excavation, as a sequel of tubercular pleurisy, or as fibroid phthisis.

Diagnosis.—The diagnosis of phthisis in children is hampered by two circumstances : first, by the way in which the disorder of nutrition masks the local lesion ; and secondly, by the fact that, under the age of six or seven, children seldom expectorate. Still, should we be able to obtain any sputum, it may be examined in the usual way for elastic tissue and tubercle bacilli. Hæmoptysis is not common in the phthisis of the young, so that, in this way again, we are deprived of what might often be an important aid. The diagnosis, therefore, rests mainly on the family history, the emaciation, the hectic symptoms, and the ultimate development of physical signs in the lungs or elsewhere.

The **prognosis** is bad, especially in very young children, in whom tubercular meningitis is very apt to be the final result—as it may be the first distinct evidence—of generalised tuberculosis.

The **treatment** is the same as in the adult. Bearing in mind the tendency of phthisis to follow whooping-cough and the pulmonary sequelæ of measles, these must not be neglected, but the child's strength should be built up by nutritious diet, tonics, and fresh country air.

ASTHMA.

Etiology.—Many cases of asthma seen in adults have begun during childhood; but, on the other hand, many young persons suffering from asthma recover before they grow up. An hereditary predisposition undoubtedly exists; a family history of gout is not uncommon, and is sometimes shown by the occurrence of skin diseases along with asthma. The immediate cause of the onset is usually an attack of bronchial catarrh, but in many cases the condition is evidently set up reflexly by enlarged bronchial glands, adenoids, nasal polypi, enlarged turbinates, &c. The source of irritation may lie outside the respiratory organs—in the alimentary tract or elsewhere. No case can, therefore, be regarded as a simple asthma until all reflex causes have, as far as possible, been excluded. The name "thymic asthma" has been applied to the form said to be dependent on the presence of an enlarged thymus.

Symptoms and Diagnosis.—The symptoms are essentially the same as in after-life. The chief possibility of error in the diagnosis lies in the risk of confusing asthma with such other forms of dyspnœa as spasmodic laryngitis, retropharyngeal abscess, &c. In them, however, the dyspnœa is inspiratory and there generally is marked retraction of the chest, while in asthma the dyspnœa is expiratory and the chest bulges considerably. On physical examination we always find numerous rhonchi scattered over the lungs.

The **prognosis** should always be guarded. If adenoids, nasal polypi, or other remediable conditions be present, it is possible for a complete cure to result. Cases following enlarged bronchial glands may also recover, as may some of those which are apparently primary; but many, whilst improving for the time being under treatment, again relapse. On the whole, however, the chance of recovery is better than in adult life, where what may be called an asthmatic habit has been set up.

Treatment.—(1) During the attacks we may employ belladonna in full doses (20 to 25 mins. of the tincture), nitrites—either the nitrite of amyl by inhalation, or the liquor trinitrini by the mouth—or chloroform. Morphia is probably the surest remedy, but should be used very cautiously, $\frac{1}{30}$ to $\frac{1}{20}$ grain being sufficient for a child three years old. (2) Between the attacks we attend to any pathological condition present which may reflexly excite the paroxysm of asthma. We have seen cases of asthma in children practically cured by the removal of adenoids, and, even where a cure does not result, great improvement often follows. In all cases it is advisable to give iodides for a considerable time. Iodide of potash (2 to 4 grs.) or syrup of hydriodic acid (10 to 20 mins.) may be given thrice daily to a child of three. In addition to (or replacing) iodide, arsenic may be employed. When bronchitis occurs it must be carefully treated, and the general health of the patient attended to.

INFLAMMATIONS OF THE PLEURA.

Pleurisy may be acute or chronic, primary or secondary. It is a common disease in children although the relative frequency with which the various forms occur is somewhat different from that to which we are accustomed in dealing with grown-up patients. Primary pleurisy may be said to be almost always due to bacterial infection. Colds—as in cases of so-called rheumatic pleurisy, slight trauma, &c., are to be looked upon merely as predisposing causes. It is most frequently met with secondarily in pneumonia (particularly in the croupous form), in tuberculosis of the lungs or peritoneum, and in rheumatism. It may also occur as a complication or sequel of one of the eruptive fevers, diphtheria, typhoid, enteritis, or Bright's disease; it may also result from direct spread of inflammation from the thoracic parietes, as in caries of a rib, or from other neighbouring organs. In pyæmia and septicæmia, pleurisy and pleuro-pneumonia are common.

Pathology.—The anatomical changes are in no way peculiar. The organisms giving rise to pleurisy are the diplococcus of pneumonia, the staphylococcus or streptococcus, the bacillus of tubercle, the bacillus coli communis, and in some cases the specific germ of the primary disease. Of these germs the first three are by far the most common; the diplococcus pneumoniæ alone accounts for a very large percentage of cases. It is found in most simple effusions, and in many purulent ones, and is apparently able by itself, under favourable circumstances, to give rise to suppuration. It is often difficult to decide whether the diplococcus (and the same, though in a somewhat less degree, applies to the other pyogenic organisms) has affected the pleura directly, or has caused a previous patch of pneumonia from which it has spread to the pleura. There seems no reason to suppose that it is impossible for any one of these organisms either to set up a pneumonia, which may or may not give rise to a pleurisy, or to pass over the lung altogether and to start a primary inflammation of the pleural surface. The staphylococci and streptococci are found chiefly in purulent effusions. Should they be present in a simple serous effusion, the prospect of its becoming purulent is greater than when only the diplococcus is found. In the latter case, too, the disease is milder and the cure more rapid than when either of the two more virulent organisms is present.

Empyema is very much more common in the child than in the adult. It may indeed be looked upon as quite analogous to the simple pleural effusion occurring in the latter, for it is more usual to find that the fluid of a large effusion in a child is purulent, than that it is simple. The younger the child the more frequently is this the case. The question may then be raised : Is an empyema in a child a serous effusion which has become purulent, or is it purulent from the first ? In all probability the latter is more often the case. We comparatively seldom find a simple serous effusion becoming purulent while under observation—apart, that is, from accidental infection by exploratory puncture. The tubercle bacillus usually excites a dry, adhesive pleurisy. In one group of cases a bilateral serous effusion, due to the spread of tuberculosis, is not uncommon ; that is, in the ascitic form of tuberculous peritonitis, where we may suppose that the pleurisy is excited by a direct spread of the infection through the lymphatics of the diaphragm. In these circumstances the left pleura is usually most affected ; the chest lesion, however, forms a relatively unimportant feature of the case. A unilateral tubercular effusion may also occur. The point of importance in connection with tubercular pleurisies is this—that we do not find, in children, that the majority of empyemas are tubercular. The student who has been accustomed to watch the chronic course of the tubercular empyemas so common in surgical wards, will be surprised to find how very different is the progress of the ordinary empyema of childhood. It is, in fact, that of an acute, as compared with a chronic, abscess. It will be gathered from the above that the tubercle bacillus is more commonly found in serous than in purulent effusions. Of pleurisies due to other organisms little need be said. The diagnosis of the cause can only be made by bacteriological methods, for, while doubtless in certain cases the bacilli of typhoid, diphtheria, &c., may cause a serous or purulent effusion, there is no doubt that, in the second instance at least, pyogenic organisms are usually also present.

Putrid pleurisy is somewhat rare. It may succeed a patch of gangrene of the lung, but more often it is due to infection with a dirty aspirator needle.

We may divide pleurisy into three groups—simple adhesive, serous, and purulent. In another series of cases it is justifiable to speak rather of **pleuro-pneumonia**, and these we may dismiss, once and for all, here. The condition partakes of the characters of a pneumonia and a pleurisy. We find the physical signs of pneumonia, and, on exploring, discover a limited amount of serous effusion. The symptoms of the pulmonary lesion predominate, the course is that of a somewhat irregular pneumonia, and the disease must be treated accordingly.

SIMPLE ADHESIVE PLEURISY.

This is on the whole infrequent, and is less often detected during life than its occurrence in the *post-mortem* room might warrant us in expecting. It is either acute or chronic, and occurs under just the same conditions as in the adult. Its recognition, however, is not so easy. In a child old enough to describe its symptoms, a little rough friction or deficiency of the breath-sounds may be found over a painful area, but in young infants we have no such guide. In them, feverishness, rapid breathing, and a slight cough are present but are not characteristic. We may, however, discover that one side of the chest is tender, by the child crying when it is touched, and the cry may give rise to palpable friction.

SEROUS PLEURISY.

This, also, may be acute or chronic. In the former series of cases the disease may be ushered in by head symptoms—fever, vomiting, convulsions, &c. Pain is often referred to the epigastrium rather than to the side. In other cases the symptoms are mainly gastro-intestinal. Fever, with vomiting, anorexia, foul tongue, and general illness, may lead us to think rather of an abdominal than of a pulmonary disorder. When the disease begins thus acutely the symptoms are very much those of a croupous pneumonia. It has already been said how fugitive and difficult of detection the signs of this disease may be, and we must confess that we have often been inclined to the idea that, in these cases of acute pleurisy, we really had to do with a small patch of unrecognised pneumonia accompanied, and perhaps concealed, by a large effusion. After all, however, the point is of secondary consequence. The symptoms of croupous pneumonia are quite out of proportion to the local lesion, and we cannot but suppose that an organism, which may give rise to a pneumonia, but instead causes a pleuritis, will in either case set up much the same degree of constitutional disturbance. When we come to examine the patient we find that his pulse is rapid—120 or 140—the breathing is also hurried—40 to 50 per minute—and the alæ nasi dilate on inspiration. The cough is short and painful; in infants, sucking is impeded; and the patient is distressed. The chlorides in the urine may be diminished.

The physical signs of effusion are so well known that we need only deal with them in outline, laying stress on any peculiarities due to the age of the patient. The first of these is caused by the yielding nature of the chest walls. Even in simple effusion, and more markedly in empyema, the affected side is seen to bulge, the ribs to be somewhat separated, and the interspaces distended. The side is more or less immobile; by reason of the greater thinness of the parietes the displacement of viscera—of the heart and even of the liver—may be plainly visible. Palpation gives us, on the whole, but little additional information. The signs just mentioned are verified, but that on which so much reliance is placed in the diagnosis of pleural effusion in the adult, is not of great practical service in the child. For the vocal fremitus is never very well marked in young infants; the child's cry, on which alone we can depend for its production, is suppressed to a greater or less extent in pleurisy, and hence the distinction between the increase in consolidation, and the decrease in effusion, is less noticeable than in the adult. The information gained by percussion is most valuable. The stroke must be quite a light one, and the crying of the child is in no way distracting, for the sign of greatest importance is the markedly increased sense of resistance. It is true that the note is also dull, but so it is in croupous pneumonia. On the other hand, in pleural effusion, the resistance as compared with the yielding sensation on the sound side is relatively greater than in the adult, and much greater than in pneumonia. On the sound side a rather hyper-resonant note, and above the effusion a flattened tympanitic note, are obtained. We can outline the dull area fairly well by percussion, but the character of the breath-sounds is perhaps the best guide as to the amount of the effusion. Small effusions should be looked for at the back on the right side, and at the back and in the half-moon shaped area on the left side. In all respects, a simple serous effusion in a child corresponds in its distribution with the adult type. On auscultating, the first thing that strikes an unaccustomed observer is that he has to do with a large area of consolidation. It is very seldom indeed that the breath-sounds are abolished, or even markedly enfeebled. Usually we hear loud, high-pitched, tubular breathing over the whole area of the effusion. Somewhat metallic râles may also be audible, the vocal resonance is well marked, and, though not actually increased, sounds high-pitched and as though it came from very near the stethoscope. The chief auscultatory signs characteristic of effusion, as opposed to pneumonia, are the high-pitched, somewhat nasal, tubular breathing, and the shrill, though not very loud, vocal resonance, which appears to be conveyed from but a short distance to the ear. If (as when much bronchitis is present) many râles are heard, the signs of a phthisical cavity may be closely imitated. We have said that the breath-sounds are rarely absent; but, on auscultating from the spine towards the axilla, it will often be found that they become diminished in intensity—a point of considerable diagnostic value. In a small minority of cases the sounds are the same as in adults.

The course of the disease is not usually very prolonged, and absorption almost invariably takes place without the necessity for aspiration. In the course of a day or two the fever subsides, or there may even be a crisis; the effusion gradually diminishes, and may be completely gone in a week or ten days. In other cases the progress is somewhat different. The effusion is absorbed less rapidly, the risk of suppuration is greater, and increases the younger the patient is. In protracted cases of simple effusion the possibility of tubercle must be borne in mind. Some cases of effusion are chronic from the first; and, save in the character of the effusion, these latent pleurisies differ in no way from the much commoner condition of latent empyema, and need not be more particularly mentioned. A subacute pleural effusion is frequently seen as an intercurrent complication of chronic pneumonia; it may appear and resolve again without much influence on the pulmonary condition. Should a pleural effusion persist for a long time, contraction of one half of the chest, scoliosis, &c., are liable to occur just as in the adult. This sequence of events is, however, more common in empyema than in simple effusion.

Diagnosis.—The diagnosis of a pleural effusion is often very difficult. In cases where it is of limited extent, and where we have no displacement of viscera to help us, the dulness with increased sense of resistance, the high-pitched bronchial breathing, and the clear, though not very loud, vocal resonance, are our chief guides. The distribution of the dulness and of the auscultatory signs may prove of assistance. In cases of pneumonia giving very similar phenomena we may find that, below the patch, there is an area of normal breath-sounds; this, of course, is much against effusion, which is almost always present at the extreme base of the lung, as well as higher up. In all cases where any doubt exists, and, we may add, where the signs of consolidation extend over a considerable area, an exploratory puncture should be made. There need be no hesitation in doing this when any benefit can be derived from the knowledge obtained; but where only an inch or two of dulness is present it is unjustifiable to put the patient even to this slight risk, unless delay in the resolution of the patch leads us to suspect the existence of pus, or some other reason for interference be evident. In exploring for fluid the following rules should be observed. The skin must be purified with carbolic lotion. The needle and syringe are sterilised by heat, or by running alcohol and then ether through them. This is preferable to the use of watery antiseptics, as when the ether has evaporated no substance is left in the syringe to interfere with the growth of germs, and an agar tube may be inoculated with prospect of reliable result. The spot selected for puncture should be that at which the physical signs are best marked. The needle should be fairly wide so that it may not block too easily, and the child should be firmly held lest, by a sudden jerk, the needle break off in the chest. If no fluid be got at the point where the syringe is first entered, it should be withdrawn and the exploration repeated in other regions. When fluid is obtained, cultures should be made on agar-agar, stained films being prepared from these and from the fluid itself. It is often possible to detect the organism most commonly present—pneumococcus, streptococcus, or staphylococcus—by simply staining a dried film of the exudate. The bacillus of tubercle cannot be so easily discovered. It may not be found in films of exudation from an undoubtedly tubercular pleurisy; indeed, to exclude it with certainty, recourse must be had to the inoculation of animals.

The **prognosis** of non-tubercular serous pleurisy is favourable, unless it occurs as a complication of some other disease. It depends on the same circumstanccs as in the adult—the size of the effusion, the state of the heart, &c. The bacteriological examination of the exudate assists in the prognosis. Cases where pneumococci alone are present almost always clear up; where there are strepto- or staphylococci, pus is apt to form. The existence of the bacillus of tubercle is an unfavourable sign.

EMPYEMA.

Pathological Anatomy and Etiology.—These are much the same as in other forms of pleurisy. The organisms most frequently found are the pneumococcus, staphylococcus, and streptococcus; there is often a mixed infection. In rare instances suppuration may result from gangrene of the lung, rupture of an hepatic abscess, &c. In such cases different organisms may be found. Empyema is much more frequently unilateral than bilateral, and somewhat more common on the left side than on the right. The pus may be free in the pleural sac, being limited by adhesions where the air-containing lung is yet touching the parietes; or it may be circumscribed, and encysted either between the lobes or between a small portion of the lung and the chest wall. In other cases, two or more pus-containing sacs are present—a loculated empyema. The pus is usually thick, greenish-yellow, and odourless; it may be putrid, or thin and watery. In the last case tubercular infection may be suspected. A pyo-pneumothorax may supervene, and of the complications purulent pericarditis is perhaps the most common.

The **symptoms and signs** of empyema are practically those of simple effusion. In empyema the exudate is usually present in larger amount, the signs are consequently more marked. Bulging of the interspaces is often very evident, and on account of the yielding nature of the chest-walls, a feeling of fluctuation may be detected. Otherwise the results of auscultation, percussion, and palpation are exactly those we have already described. There is no reliable test for the presence of pus except the use of the exploring needle. Œdema of the side is too inconstant to be of great service; its presence is suggestive of, though its absence is not against, the idea that the case is one of empyema. The temperature is no great practical guide; it may be elevated, but it is not infrequently normal. An altered character of the vocal resonance has been said to occur, but this is of no value in the recognition of empyema. The general condition of the child, however, is naturally worse when pus exists. The patient is prostrate, wasted, and anæmic; sweating and nocturnal fever may be marked.

The **course** of the disease varies. At times it occurs acutely; within a few days of the onset we detect a considerable exudation into the pleural cavity, and, on exploring, discover its purulent nature. In many cases the history is somewhat as follows:—A few weeks ago the patient was taken ill with vomiting and fever, he had a short hard cough and seemed distressed for breath. After a day or two he recovered, but has not regained his health and strength. He has gradually become weaker and more breathless, and his cough is still present though not severe. On examining the patient we find the chest full of fluid. Such a history suggests that we have to do with a pneumonia and consecutive empyema—a **metapneumonic empyema.** When, in a case of pneumonia, the temperature does not fall as it should, but becomes irregular, while the dulness persists and the other signs of empyema develop, we speak of a **parapneumonic empyema.** Again, the course may be entirely latent, and only when the chest is examined in the ordinary routine is the disease discovered. Even in such cases, however, misleading as the history may be, the rapid breathing and immobility of one half of the chest should lead to the suspicion that the respiratory system is affected. When an empyema is neglected it will progress until the pus is evacuated by rupture to the skin surface or elsewhere. The discharge of pus by a bronchus is not common; it is an undesirable termination, since pyo-pneumothorax is the common result. Nevertheless a natural cure may result in this manner. An empyema may point under the skin—**E. necessitatis**—in almost any situation. It tends to do so where the parietes are thin, hence the anterior ends of the lower intercostal spaces and the region about the lower angle of the scapula are common sites. On the left side a pulsating empyema may result. It is of some importance, as regards the treatment, to remember that when an empyema necessitatis exists, the point of exit under the skin does not always correspond in position to that at which the pus burst through the thoracic pleura, but that a fistulous track running between the layers of intercostal muscle may be found. In protracted cases of empyema where the lung has been so long compressed as to be unable to expand, deformity of the chest and spine will result.

The **prognosis** of empyema is on the whole good. A cure is to be expected except in cases where tuberculosis is the cause. Before the age of two years the prognosis is worse, but even in young infants a satisfactory result may be obtained. In putrid empyema it is less favourable than in simple ones, although here, too, antiseptic treatment has led to many recoveries. In double empyema the prognosis is grave. The general death rate is about 15 per cent. The severity of the illness depends largely upon the organism present—the pneumococcus being the most, and the streptococcus the least favourable.

The **diagnosis** depends mainly on the result of exploration.

Treatment—Pleurisy.—Simple adhesive pleurisy requires little treatment. To relieve the cough and subdue pain we may order syrup of chloral and syrup of tolu in equal parts, the dose being from 15 minims upwards according to the age of the child. Locally the chest may be strapped, or poultices or blisters may be applied. The last of these require to be used with caution, and in young and weakly children should not be employed lest sloughing of the skin result.

In cases of serous effusion, only simple measures are needed. Locally we poultice, counter-irritate with iodine, or blister. Internally, we give laxatives, and diaphoretic and diuretic mixtures, such as the following:—℞. Potass. acetat., gr.ij; Infus. digitalis, ʒss; Liq. ammon. acetat. ad ʒij; every four hours, for a child of four or five. In more chronic cases we may order: ℞. Ammon. iodid., gr.ij; Syrup. ferri iodid., min.x; Aq. menth. pip. ad ʒi; every four hours. Cod-liver oil and quinine may also be given. The indications for aspiration are: a very large effusion, irregularity of the pulse, and the occurrence of suppuration. In a child a simple effusion very rarely persists so long that, for this reason alone, we need to tap it. The very chronicity would be in some degree a contra-indication, since, in such a case, tubercle might be reasonably suspected, and the danger of tapping a tubercular pleurisy, unless special necessity should arise, is sufficiently recognised.

Empyema.—Here the indication is to remove the pus. In cases of small encysted empyema, simple aspiration may prove sufficient. Should the cavity refill quickly, or (when it refills slowly) should one or two tappings be followed by re-accumulation of pus, no further time must be lost, but the chest should at once be opened and drained. This may be done by simple incision or by resection of a rib. Simple incision is so satisfactory an operation that resection need not, in ordinary circumstances, be resorted to in the first instance. The size of the interspaces and the probability of interference with the lumen of the drainage tube must, however, decide our selection of operation in any individual case. Unless the pus be putrid, the cavity should not be irrigated, either at the time of the operation or at subsequent dressings. In favourable cases the discharge lessens in the course of a few days, and by the end of a week or ten days the tube may be removed. The only inconvenience likely to occur in simple incision is the blocking of the tube with thick flakes of pus. If this repeatedly recur the resection of a rib may be needed. In cases where the empyema points, it must be opened at the point of emergence. In such cases a counter-opening may be necessary. Resection of one or more ribs (Estlander's operation) may have to be performed in severe instances.

In good cases the recovery is so complete that it becomes impossible, in the course of a week or two, to detect any abnormality about the chest. Quinine, iron, and cod-liver oil are required in the subsequent treatment.

CHAPTER XVI.

DISEASES OF THE URINARY SYSTEM.

Contents.—Bright's Disease—Urinary Lithiasis—Hydronephrosis—Tumours of the Kidney—Cysts of the Kidney—Vulvo-vaginitis.

BRIGHT'S DISEASE.

For all practical purposes nephritis in children is probably best described under the one heading of **diffuse nephritis**, which may occur acutely or be chronic. It is true that cases of cirrhotic Bright's disease are sometimes seen, but they are extremely rare.

Etiology.—By far the commonest cause of nephritis in children is scarlet fever. The kidney affection usually develops about the twelfth or fourteenth day of the disease, but may appear earlier or later than this. Slight albuminuria often supervenes with the initial pyrexia of scarlet fever, as it may in other infectious diseases; it is usually transient, but may go on to actual nephritis. Bright's disease may also occur in diphtheria, typhoid, or erysipelas, but much less commonly than in scarlet fever; still more rarely does it follow measles, tonsillitis, mumps, chicken-pox, &c. Nephritis is not, however, always preceded by an infectious disease; as in adult life, it may follow exposure to cold and damp. One form which has been proved to be fairly common is the nephritis of the newly-born; this is due to a too prolonged exposure to the atmosphere at birth. Albuminuria in the newly-born infant is very common; in many cases it is probably the result either of temporary congestion of the renal vessels from changes in the circulation, or of the uratic infarcts so frequently present. In other cases the persistence of the albuminuria may point to a true nephritis.

Inflammation of the kidney may also follow gastro-intestinal affections, and particularly cholera infantum. Various medicinal remedies, such as turpentine, cantharides, tar, carbolic acid, and chlorate of potash may also give rise to it.

Morbid Anatomy.—In post-scarlatinal nephritis the lesion is mainly situated in the glomeruli; in nephritis from exposure, &c., it is more strictly limited to the tubular epithelium. In either case the large pale kidney may at length result, and then, in its turn, progress towards contraction.

The **symptoms** vary considerably in different cases. Typically, a convalescent scarlet-fever patient complains of headache, vomits once or twice, and becomes œdematous about the face; the urine diminishes in amount, becomes darker than normal, and contains a deposit. It is acid, of high specific gravity, is loaded with albumin, and contains blood; the deposit consists of uric acid crystals, urates, epithelial and granular casts, epithelial and blood cells, and débris.

The urine may be bright red, claret-coloured, or only slightly smoky. The œdema varies; in some cases it is extreme, the face being puffy, and the abdomen, back, scrotum, and thighs distended and swollen. There may be an initial rise of temperature, but this is inconstant.

The condition may only last for a day or two in its severe form, and then gradually subside; more commonly, however, there are distinct symptoms for several weeks. The œdema and scanty urine continue, there is frequency of micturition, and the patient becomes anæmic; the bowels are constipated or occasionally loose, and the skin is dry. The pulse is not usually very rapid—in some cases it may be distinctly slowed; the tension is, as a rule, low, and there may be irregularity or intermission. Frequently the heart is dilated, and its sounds are feeble. Nervous symptoms may be marked; headache, especially, is often a common feature, as also is vomiting. Convulsions sometimes supervene; they may be mere twitchings of the face or actual epileptiform seizures, and are often associated with some other symptoms of uræmia, such as amblyopia, breathlessness, and the like. Uræmia may, however, suddenly supervene without any previous signs of illness except albuminuria and, perhaps, some œdema. The patient may recover from the convulsions, or become comatose and gradually sink.

Varieties and Complications.—Instead of disappearing in three or four weeks the nephritis may become chronic. Thus, in some cases, even while the flow of urine increases, the albumin and casts remain, the œdema becomes worse and the child is completely water-logged, striæ of the skin are produced, and ascites and hydrothorax are also present. This state of matters may last for one or two months and then gradually disappear, or sudden recovery may at times ensue. After several months have elapsed the probability of cure is not very great. In other cases the urine increases in amount and the anasarca disappears, only, however, to reappear again in a few weeks or months; these relapses may occur again and again until the fatal issue.

Sometimes there is no œdema at all; the patient feels sick, complains of headache, vomits occasionally, and becomes anæmic; on examination the urine is found to be scanty and to contain more or less albumin. The œdema may remain absent during the whole course of the disease, or it may develop as time goes on. Cases in which there is œdema of the face and perhaps of the body, but no albuminuria, are occasionally seen. The urine may, however, contain hyaline casts, and on *post-mortem* examination, the kidneys are found to be in a condition of acute inflammation. Such cases are extremely rare. It is not unusual, however, in an ordinary case of Bright's disease, for the albuminuria to disappear temporarily from time to time.

While constipation is the rule in Bright's disease, diarrhœa is by no means unknown, and is probably due to the elimination by the intestine of poisonous substances circulating in the blood. There may be a certain amount of tenesmus with it, and sometimes an actual colitis supervenes. Anæmia is a prominent feature when the disease has lasted any time. Heightened arterial tension, with hypertrophy of the left ventricle, but rarely occurs in childhood; more frequently the heart becomes dilated. Breathlessness is nearly always present; it may be due either to hydrothorax, œdema of the lungs, weak circulation, uræmia, or to a combination of these. In consequence of the anasarca various skin eruptions are apt to supervene; thus intertrigo and eczema are common, and there is often a great liability to bed-sores. Broncho-pneumonia is somewhat likely to accompany Bright's disease. Albuminuric retinitis should be looked for in chronic cases; when found, it is an unfavourable sign. Hemiplegia and other forms of paralysis occasionally occur.

Course and Prognosis.—As has already been mentioned, these differ widely in different cases. There may be complete recovery in a few days. Most commonly the disease lasts for three or four weeks, then the dropsy disappears and the urine returns to normal. In a considerable percentage of cases, however, a fatal issue follows; sometimes this occurs rapidly with almost complete anuria and uræmia, sometimes the patient becomes more and more anasarcous, and the albuminuria increases until death results from heart-failure, gradual asthenia, or uræmia. Very commonly, good progress is made for a time, but a relapse, sooner or later, proves fatal. In these cases, although the dropsy disappears, the albuminuria persists; this combination of signs is, therefore, rather unfavourable than otherwise. In a few instances there is no symptom except albuminuria, and, nevertheless, the patient may suddenly die from uræmia.

When a case becomes chronic there is little chance of recovery, even although the quantity of urine may rise to or beyond the normal, so long as the albuminuria and the other signs of the disease are present. Occasionally, however, sudden recovery takes place after weeks or months of albuminuria and anasarca.

The **diagnosis** of a typical case is easy. The œdema, scanty urine, albuminuria, anæmia, headaches, and vomiting, make a perfectly clear clinical picture. But in many cases a few of these only are present. The presence of œdema, with or without anæmia, should always make us suspect the disease, and lead to an examination of the urine. It is not sufficient, in a suspicious case, to test for albumin, but the deposit should also be examined microscopically, whereupon, even should albumin be absent, casts may be found.

Treatment.—The child should lie in bed between blankets, the skin should be kept active by warm diluent drinks, and the bowels opened by a hydragogue cathartic, such as calomel, jalap, or a saline. To increase the quantity of urine, simple saline diuretics, such as acetate of potash, bicarbonate of potash or soda, or benzoate of soda, should be given. The patient must be kept on a diet of milk and farinaceous foods, all nitrogenous substances being avoided. If the anasarca be great and the kidneys not acting well under simple diuretic remedies, poulticing or dry cupping over the lumbar region must be tried. Above all we must aim at procuring free perspiration. For this the wet pack is the most generally useful method. The child is wrapped in a large cloth wrung out of hot water, and is covered with mackintosh and a blanket, care being taken that the pack is not so hot as to scald the patient. After a half to one hour the pack is removed and the child wrapped up in warm blankets, whereupon copious sweating usually results. In place of the pack a hot air bath may be used, but is less convenient. In addition to acting on the skin by warmth, liquor ammoniæ acetatis and other diaphoretics may be given while the patient is in the pack. Collapse must be looked out for and, as far as possible, prevented by the use of stimulants. Though sometimes of value, pilocarpine is a rather dangerous drug, and its action must be carefully watched. It should be given subcutaneously in doses of $\frac{1}{10}$ grain to a child of six. Dangerous results may follow a larger dose; sudden collapse and pulmonary œdema are apt to ensue. A somewhat greater quantity may be given by the mouth.

When uræmia supervenes, the measures indicated above must be carried out. In addition, a warm bath may be given, and the bowels must be freely moved by salines; here it is also useful to give water or saline solution in large quantities by the mouth, and saline solution subcutaneously. In serious cases venesection, or leeching behind the ears, should be tried. If the child be taking fits, chloroform or amyl nitrite may be administered to obviate the immediate danger, whilst bromides, chloral, and nitrites, may be given by the mouth or bowel. Ascites may require repeated tapping, and sometimes fluid of chylous appearance, from the presence of broken-down fattily degenerated cells, is drawn off.

In less acute cases the tincture of digitalis or strophanthus is very useful both in removing the œdema and in stimulating the heart, and may be given in doses of 1 minim for every year of the child's life. It may advantageously be combined with nitrites. For the anæmia, perchloride of iron is by far the most useful remedy. Tannic acid may be tried with the view of diminishing the amount of albumin in the urine. As the child begins to improve, the diet is gradually increased, fish, chicken, veal, &c., being added in turn. The parents must be warned of the danger of relapse, and of the necessity for preventing exposure to cold and wet.

Cirrhotic Bright's Disease

is a very rare disease in childhood. Its etiology is not very clear; probably, it usually follows some acute infectious disease. Goodhart suggests that it may in some way be connected with the occurrence of renal calculi. Most of the patients have died with uræmic symptoms, without a diagnosis having been arrived at during life.

URINARY LITHIASIS.

At birth, the so-called "uratic infarcts" are found in the kidney; they are excreted in the first weeks of life. That these may sometimes give rise to pain during expulsion is shown by crying and drawing up of the legs before, during, or after micturition. Besides these, which are almost always present, but which are in most cases excreted painlessly, small calculi may occur even in the first weeks of life; and a stone of some size has been found in the bladder within a month or two of birth. The pain produced by gravel is frequently mistaken for intestinal colic, but if its periods of incidence be carefully noted, it will be found that they are related to the act of micturition. In such cases the stains on the napkins will be found to be reddish at the margins, and small brown-peppery grains of uric acid may be visible. In other cases, though no gravel can be seen, the urine is highly acid, and the acidity alone is sufficient to cause pain.

URINARY CALCULUS.

The **etiology** of the disease is the same as in the adult, but in children the hereditary predisposition is more readily made out. A large proportion—at least one-third—of all cases of stone occur before the fifteenth year.

The **symptoms** are, in the main, the same as in the adult, and need not be referred to at any great length. In renal calculus, pain is complained of in the back by older children; there may be tenderness on palpation of one kidney, and albumin, blood, or pus may appear in the urine. In many cases, however, renal calculus is found *post-mortem*, without having been suspected during life. Renal colic is not seen in its typical form in young children, but extreme pain, shown by the cry and contortions of the child, may be due to the passage of a stone along the ureter.

Vesical calculus is generally shown in young children by painful and frequent micturition, and dribbling and incontinence of urine. The prepuce is often elongated from the child pulling at it to relieve the pain, there is great straining, and consequently prolapsus recti is common. Whenever (and this applies to girls as well as to boys) symptoms point to some affection of the urinary tract, for which no satisfactory explanation can be found and which simple treatment does not remove, the bladder should be sounded. A recto-abdominal examination is, in some cases, of considerable value in determining the presence of a stone. Occasionally, after a very severe attack of pain, a fairly large calculus may be passed and found on the napkin.

The **diagnosis** of calculus rests chiefly on finding crystals in the urine; if albumin, pus, and blood be also present we know that an inflammation of the urinary tract has resulted from it. In suspicious cases the possibility of stone in the bladder cannot be set aside until the sound has been used.

The **prognosis** is in most cases good. Sometimes, however, owing to cystitis, pyelitis, &c., a fatal issue may result.

Treatment.—In all cases of gravel, or even where there is only excessive acidity of the urine and painful micturition, we should put the child on alkalies and order large quantities of water to be drunk. In order to render the urine less acid, liq. potassæ (2 to 4 mins.) or the bicarbonate or acetate of potash (5 grs.) may be given, and it is often well to combine therewith a few minims of tincture of hyoscyamus to soothe the irritated urinary tract. In older children, sufficiently large doses of the above-mentioned drugs to render the urine somewhat alkaline should be given. Piperazine, in 5-grain doses, is also said to be of use by reason of a solvent action on renal calculi. When symptoms of renal calculus have lasted for some time notwithstanding treatment, exploration of the kidney should be advised. Whenever a stone of any size is found in the bladder operative measures should be adopted.

HYDRONEPHROSIS.

The condition may be present at birth or may develop afterwards. Of the latter cases some are due to congenital causes, others to acquired lesions. Hydronephrosis, then, may result from various lesions of the ureter, such as impermeability, constriction, the presence of valves, the pressure of an abnormal renal artery, twists caused by the displacement of an abnormally movable kidney, calculi, &c. ; or it may proceed from affections lower down in the genito-urinary tract—from phimosis, stone in the bladder, stricture, and the like. When the obstruction is above the bladder the hydronephrosis (unless in rare cases of double lesion) will be unilateral ; if lower down it will be bilateral. In addition to these mentioned, some remarkable cases have been seen in which, soon after birth, a hydronephrosis of obviously prenatal origin was found, without distinct obstruction in the urinary passages.

The **symptoms** vary greatly. In some cases where the hydronephrosis is great the children are still-born ; in others they die soon after birth. Sometimes the condition is only found *post mortem*, no symptoms having been present during life. In many, after the appearance of a tumour in one or both loins, death results from anuria. In a few cases, although the swelling is recognizable, the patient may live for an indefinite period without any serious symptoms. Occasionally, there is, for a time, a greatly diminished flow of urine, along with the development of a bulging in one or both flanks ; this is followed by a copious excretion of watery urine, after which the swelling subsides. Such a train of symptoms is liable to recur.

The swelling in the lumbar region has the usual features of a cystic renal tumour, and is diagnosed from a pyonephrosis, pyelitis, or perinephric abscess chiefly by the absence of fever, of tenderness, and of purulent deposit in the urine.

Prognosis.—As a rule, congenital hydronephrosis is fatal. The disease is much more serious when bilateral than when only one side is affected. Though a few cases persist without any change for a very considerable time, this is exceptional, and, on the whole, the prognosis is grave.

Treatment.—In those instances where the lesion is unilateral and comparatively slight, and where the constitutional symptoms are almost absent, the patient had better be left alone. Sometimes careful massage will empty the cyst by overcoming a slight resistance ; the treatment must, however, be carried out with great care lest harm be done. Tapping from behind, posteriorly to the line of reflection of the peritoneum, gives relief. Occasionally, accumulation does not again take place, but if it does so, operative treatment may be needed.

TUMOURS OF THE KIDNEY.

Etiology.—These are relatively common in the early years of life. Of all cases of kidney tumour, most occur before the tenth year, and the great majority of these are found before the age of five. The two chief varieties of neoplasm are sarcomata and carcinomata, and the former are much more common than the latter. The sarcomata are mostly round-celled—either large or small—but spindle-celled growths also occur, and myo- and adeno-sarcomata are occasionally found. Except in the case of congenital myo-sarcomata, when both kidneys are affected, only one of the organs is usually the primary seat of the disease, involvement of the other being secondary.

The chief **symptom** is the appearance of an abdominal tumour. This is at first situated in one lumbar region, but later the whole abdomen is distended. The lumbar region posteriorly on the affected side is usually the fuller, and on palpation, with one hand in the ilio-costal space, the growth is readily made out. The chief difficulty in the diagnosis is from a splenic enlargement on the left side and from an hepatic enlargement on the right. In renal tumours a resonant note is obtained anteriorly from the presence of the colon. This is absent in cases of hepatic and splenic tumour. A resonant area can usually be made out between a growth in the right kidney and the liver ; on the left side, the dulness extends back to the spine if the kidney be affected, while, if the spleen be the seat of the growth, a resonant note can be obtained between it and the vertebral column.

The growth may be very resistant or comparatively soft ; it is not usually tender. There may be ascites and a little dilatation of some of the superficial abdominal veins, whilst œdema of the legs is not infrequent. As regards other signs, pain may or may not be present ; it may either be fairly constant, or paroxysmal as in renal colic. The child usually becomes pale and cachectic. Micturition is not very frequent ; it is occasionally painful from the passage of clots. Hæmaturia is an important positive symptom, but in the majority of cases it is absent. The urine may be port wine coloured and contain clots, or may be only faintly tinged. The hæmaturia may be constant or intermittent, but movement and position have little effect upon it. Apart from the blood there is usually no abnormal constituent in the urine, but in a few cases true albuminuria and casts appear late in the disease.

The growth progresses rapidly, and death generally ensues in less than a year from its first recognition. Sarcomata seem to be more rapidly fatal than carcinomata.

Diagnosis.—The existence of renal enlargement with hæmaturia is very suggestive of kidney tumour. The same symptoms may also occur in renal calculus and pyelitis, but in the former the bleeding is worse when the patient exerts himself, the tumour is smaller, and the pain more severe and paroxysmal. In the latter there is pus in the urine and the tumour is tender on palpation. When hæmaturia is absent the diagnosis is much more difficult. The irregularity of tumours, the rapidity of their growth, and the cachexia are the chief points which differentiate them from other kidney lesions.

Treatment.—In the late stages of the disease nothing beyond palliative measures should be adopted. Nephrectomy is a very serious operation in childhood, and although, if a case be diagnosed early, it should probably be advised, it must be admitted that the results are very disappointing.

CYSTS OF THE KIDNEY.

Congenital cystic degeneration is usually bilateral, sometimes unilateral. It is often associated with imperfect development of the upper part of the urinary tract. The tumour may be so large as to give rise to difficulty at birth. The children are generally small and premature ; if not still-born they rarely survive more than a day or two, unless only one kidney be affected, when they may live for several months. The diagnosis is seldom made during life.

Paranephric cysts, developed from the connective tissue round the kidney, and **hydatid cysts**, are very rare.

Pyelitis, pyonephrosis, and **perinephric abscess** are occasionally met with in childhood ; they present no special features either in their causes, symptoms, or treatment.

VULVO-VAGINITIS.

A greenish-yellow discharge from the vulva, tending to form crusts on the labia and inner sides of the thighs, is not uncommon in young girls. It is frequently accompanied by an inflamed condition of the vulva, perhaps even by small ulcers, as well as by enlargement of the glands of the groin. There may be considerable pain on micturition.

Etiology.—Only in a minority of cases is vulvo-vaginitis of gonorrhœal origin, and this is a point of some importance, since the mother is apt to think that an assault has been committed on the girl. Even in cases where the gonorrhœal nature of the discharge is shown by the presence of the gonococcus, it should be remembered that contagion may have resulted from contact with soiled linen. As a rule, however, vulvo-vaginitis is caused by lack of cleanliness, by prolonged contact of dirty clothes, by the presence of thread-worms, &c., especially in poorly nourished children.

Diagnosis.—In suspected cases films of the pus may be stained and examined for gonococci, but too much reliance should not be placed on the bacteriological examination. Evidences of violence should be looked for, and the state of the hymen noted.

Treatment.—Careful douching with mild antiseptics, such as boric acid, permanganate of potash, &c., and, later, astringents is, as a rule, all that is needed. A general tonic is indicated in most cases. Thread-worms should be treated if present. In some cases vulvo-vaginitis is very obstinate.

Other Affections of the Vulva.—Primary syphilitic lesions are rare ; mucous patches occur in most cases of congenital syphilis. Noma, thrush, herpes, &c., are extremely uncommon. Hæmorrhage from the vulva is often observed in newly-born children ; it is of little moment, and must not be mistaken for premature menstruation. Adhesions between the labia, similar to those so often found between the prepuce and glans, may be met with ; they are easily broken down with a probe.

CHAPTER XVII.

DISEASES OF THE NERVOUS SYSTEM: FUNCTIONAL.

Contents.—Infantile Convulsions—Epilepsy—Laryngismus Stridulus—Congenital Laryngeal Stridor—Tetany—Chorea—Spasmus Nutans—Habit Spasm — Spasmodic Wry-Neck and other Spasmodic affections of Peripheral Nerves—Hysteria—Pavor Nocturnus, or Night Terrors—Insomnia—Enuresis—Migraine, Headaches, and Neuralgia.

INFANTILE CONVULSIONS: ECLAMPSIA.

ALTHOUGH strictly speaking only symptomatic, infantile convulsions are so frequent as to merit particular study. They may be due to the most trifling causes, or they may be of the gravest import ; and while their chief significance depends on their origin, if prolonged, they may, quite irrespective of this, lead to serious results both immediate and remote.

Etiology.—The causes of convulsions are manifold. The instability of the developing nervous system is an ever-present factor; the higher centres have not yet acquired that inhibitory power over the lower centres which they gain in later life. This state of unstable equilibrium is increased by at least three conditions: by malnutrition and anæmia, by the neurotic heredity, and above all by rickets. In the presence of any of these conditions fits are extremely likely to occur, especially when any exciting cause comes into operation. Now, without attempting to classify the exciting causes of fits in a scientific fashion—a matter difficult in theory and often impossible in practice—we may indicate the main groups into which they fall. (1) Reflex causes. The chief sources of peripheral irritation are lesions about the anus and genitals; abnormalities of the eye and of the ear (including the presence of wax in the meatus); adenoids, and nasal obstruction from any cause; and last, teething and the presence of worms. That intestinal parasites *may* cause eclampsia is almost certain; whether they often actually *do* so is another question. The same holds good with regard to dentition; when, after due examination, no other cause than the eruption of a tooth can be detected, it is more logical to attribute the fit to dentition than to regard it as idiopathic. It matters little whether we look at the matter thus or no; the important point to be attended to is that we must not regard a convulsion as due to intestinal worms or teething, unless all other causes are definitely excluded. (2) A far more numerous series of cases are those where the cause is to be found in gastro-intestinal disorder. Some of these are no doubt reflex, others partake more of the nature of an auto-intoxication, and so we are naturally led to the next group. (3) Toxic conditions. Of these, uræmia—not, however, very common in childhood—with lead and arsenical poisoning are the chief. (4) In the initial stage of an acute illness the usual rigor is, in childhood, often replaced by an eclamptic seizure. In the later stages fits may also occur; here probably toxæmia, exhaustion, and cerebral anæmia and congestion play various parts in producing them. (5) A direct cerebral lesion is responsible for a few cases: organic brain disease, meningitis, and tumour are usually attended by convulsions; trauma, especially at birth, and cerebral anæmia or hyperæmia have also to be mentioned. In whooping-cough fits are common; they are no doubt predisposed to by the convulsive nature of the disease, and the exciting cause appears to lie in the cerebral congestion, or even hæmorrhage, which the paroxysms of coughing produce. (6) Finally, we must bear in mind the possibility of true epilepsy, and this especially in children above four or five years.

The majority of cases of convulsions occur during the first two years.

Symptoms.—Some warning may be given, such as restlessness, twitching of the face, movements of the eyes, or in-turning of the thumbs and toes. At other times the fit occurs quite suddenly. There are tonic and clonic convulsions affecting more or less of the muscular system, the eyes twitch, the face is contorted; it is at first pale, then cyanotic. The pulse becomes feeble, respiration is interrupted and shallow, rattling and hissing sounds are produced in the throat, and urine and fæces may be involuntarily expelled. In true eclampsia consciousness is always lost, though reflex excitability is not entirely in abeyance. Except in very severe cases the conjunctival reflex can be elicited; its absence is not, however, a fatal sign. While the duration of a fit is usually short—one minute or less—it may be much more prolonged. The fit may be single and not be repeated; it may recur at indefinite intervals; or the patient may pass from one convulsion into another with but little appreciable remission.

Eclampsia, however, may be less generalised than what has just been described; it may consist only of a jerking of the head and rolling of the eyes, with or without a slight spasm of the arms and legs. Much more important than its severity is the distribution of the convulsion: bilateral eclampsia suggests a general cause, unilateral spasms a central lesion. Valuable as this rule is, it is by no means absolute; general convulsions may usher in meningitis or cerebral paralysis, local ones may be due to some trivial and transient cause.

The **diagnosis** of a convulsion is easy, but that of its origin is often very obscure. One of the chief guides has been indicated in the lines immediately preceding, and the question there alluded to is really the principal point in the diagnosis. Are the fits of general or of local (cerebral) origin? Examination of the pupils, and of the limbs as regards the presence of spasm or paralysis during the intervals, and enquiry into the history, enable us to form an opinion in this matter. General convulsions with high temperature, occurring suddenly in the midst of good health, suggest the onset of an acute disease. A history of vomiting, diarrhœa, indigestion, or constipation may throw light on the case; the ejecta should be inspected if possible. The various sites of reflex irritation, especially the genitals and ears, should be examined. We should also note the general health of the child, and the presence or absence of rickets. If the fit occurs during the course of another illness, we have to take into account the possibility of exhaustion and anæmia of the brain, toxæmia, asphyxia, or a complication. Convulsions occurring during the first few days of life are usually due to meningeal hæmorrhage. In doubtful cases the urine must be examined. Worms are rare in very young children. Dentition should not be too hastily accepted as the cause. True epilepsy is rare; it can hardly be suspected in children under four or five, and after that should be diagnosed only when the regular recurrence of the fits and the absence of any cause can be ascertained. In some cases of infantile eclampsia no satisfactory reason for the occurrence of fits can be found; they are then regarded, with what justification is doubtful, as idiopathic.

Apart from the causal conditions, the complications of eclampsia are two: laryngismus stridulus, and carpo-pedal spasms. These are almost invariably associated with rickets.

The **prognosis**, in so far as it depends on the cause of the fits, is usually self-evident. Some other points, however, require consideration. In young infants convulsions may, and often do, prove fatal, and this the more readily the younger and feebler the child. Towards the end of an exhausting illness they are of serious import, especially if associated with hyperpyrexia; at the beginning they have little significance. A single convulsion in a healthy child is in itself rarely fatal; recurrence makes the prognosis worse, both as regards life and as regards mental impairment, as well as in respect of the possibility of permanent epilepsy. Severe and repeated seizures must, in most instances, have a temporary, or it may be a permanent, deleterious effect on the brain tissue; idiocy sometimes results.

Treatment.—Warm or mustard baths will usually have been employed before the physician arrives. While the patient is in the bath or pack, cold affusion to the head, or cooling the water in the bath, may be tried. Failing a speedy result, it is better not to temporise, but at once to give chloroform; a small quantity is often sufficient to quiet the spasms, and that, if reasonable care be exercised, with absolute safety. While the seizure is thus under control, chloral should be given by the rectum (at six months, 4 grs.; at twelve, 6 grs.; at two years, 8 to 10 grs.); the effects of the drug may be expected in about twenty minutes. Should the convulsions continue in spite of this, the use of chloroform is persisted in, or morphia may be given subcutaneously. We may use about $\frac{1}{48}$ grain of the sulphate for every six months of life, but the drug is seldom necessary, since, when an efficient nurse or intelligent attendant can be obtained, it is probably safer to confide the use of chloroform to their hands. Recurrence of the fits may be prevented by the use of bromides and chloral in moderate doses, and, in addition, the cause must be sought and treated.

EPILEPSY.

This disease presents no special features when it occurs in childhood; it is rare before the third year, and does not very often develop before puberty. In the epilepsy of young children, special examination should be made lest a cerebral paralysis be overlooked. Jacksonian epilepsy has the same significance as in later life.

LARYNGISMUS STRIDULUS.

This disease, "child-crowing" as it is popularly called, is probably to be regarded as a convulsive seizure of a limited extent. It is especially prone to occur in rachitic children, and the spasm, at first confined to the glottis, may spread to the limbs and result in eclampsia. While, on the one hand, it is closely allied to convulsions, the disease called tetany (if we admit that ordinary carpopedal spasms are a mild variety of tetany) is a very frequent concomitant. It has been supposed that craniotabes is a direct cause of laryngismus; the truth, however, appears to be that it, like laryngismus, eclampsia, and tetany or carpo-pedal spasm, is nothing but a manifestation of the general disease, rickets. Rachitis then is the chief predisposing cause of laryngismus, but, as in the case of the other nervous accompaniments of that disease, attacks may be excited in various ways. Thus fright, exposure to cold winds, outbursts of crying, catarrhs, and enlargement of the bronchial glands (it is said) may induce a glottic spasm. They not infrequently, however, occur during sleep and may be repeated several times in the course of the night, when no exciting cause is evident. Children between the ages of six and twenty-four months are usually affected, and the malady is most common in the spring of the year.

Symptoms.—The onset is sudden; the child (who has perhaps been occasionally heard to give a crowing inspiration) is seized with apnœa, the face is pale, tending to become livid, the body is rigid, the head retracted, and, in severe cases, the diaphragm is in a state of tonic contraction. After lasting a few seconds the spasm relaxes, air enters the glottis with a loud crowing sound, there may be a little vomiting, and, for the time being, all is over. Such attacks may recur a dozen times in the course of one night, they may on the contrary be much fewer; a repetition is, however, practically invariable. In severe cases the spasm extends to the ocular muscles, and squinting occurs. The thumbs are drawn into the palms, and the toes towards the soles of the feet—carpo-pedal spasm. The muscles of the forearms, in addition, may become tonic, giving a close resemblance to tetany; as stated above, even general convulsions may ensue. The most extreme cases of laryngismus are those where the apnœa persists, and the laryngeal stridor is in consequence absent; they may prove suddenly and rapidly fatal. As such an event is somewhat rare, the **prognosis** is on the whole favourable.

The **diagnosis** of laryngismus is easy. The only diseases at all resembling it are pseudo-croup and congenital laryngeal stridor; in practice, the distinction from these is not difficult.

Treatment.—By the time the patient is seen the spasm is usually past; should it still be present we may depress the tongue or tickle the fauces so as to induce retching, and so relax the spasm. Dashing cold water over the child may reflexly stimulate inspiration. In extreme cases tracheotomy may be needed. With the view of preventing recurrence a few grains of bromide and a grain of chloral may be ordered, but treatment directed against the rickets is of far greater importance and should be at once begun.

Spasm of the glottis occurs in sundry other conditions. In some children an attack of crying results in temporary apnœa and stridulous inspiration. Another group of cases is comprised under the term

CONGENITAL LARYNGEAL STRIDOR (INFANTILE RESPIRATORY SPASM).

In some infants, chiefly (it is said) of the female sex, a loud stridor is noticed almost immediately after birth, or, it may be, some weeks later. This stridor is inspiratory and begins with a hoarse croak, but ends with a higher-pitched crow (*Thomson*); it is more or less continuous, though when the case is watched it is found to disappear periodically, only to return after, at most, an hour or two has elapsed. The stridor persists during sucking and yawning, and when the nostrils are compressed; it is aggravated by excitement of all kinds, and may then even be heard with expiration. During deep sleep it is often absent, returning as the child begins to awake. Loud crying may temporarily abolish it. It is characteristic of the condition that, though the lower interspaces and supraclavicular hollows are drawn in during inspiration, there is neither rapid breathing, movement of the alæ nasi, dyspnœa, nor cyanosis; the cry is not hoarse, and the child seems to suffer little discomfort. After its first appearance the stridor increases for a month or two, then gradually diminishes, and disappears by the eighteenth month or second year. Its duration is quite uninfluenced by treatment. The pathology of the disease is uncertain; it appears to have nothing to do with rickets, nor does it affect the general health of the child. Thomson, who has carefully described the condition, is of opinion that it is due to disorder of cerebral function, leading to disturbance of the co-ordination between the thoracic and laryngeal muscles. He looks upon it as a developmental neurosis, in some respects analogous to stammering. From laryngoscopic examinations which have been made it has been regarded as due to mechanical obstruction of the larynx by an abnormally curved epiglottis.

Diagnosis from laryngismus stridulus: (1) Congenital stridor is more or less continuous; laryngismus is paroxysmal. (2) It occurs in infancy; laryngismus is a disease of the first dentition. (3) The general health is good, the patients are not at first rickety, though they may afterwards become so. Facial spasm, tetany, and eclampsia are usually absent. (4) Stridor may disappear with loud crying and at night; laryngismus is aggravated by crying and is peculiarly liable to take place during sleep.

Except for the fact that the respiratory spasm is less marked when the general health of the patient is improved, the condition is not amenable to **treatment.**

TETANY.

This disease is relatively common in young people, and probably the majority of all cases occur in infancy. Of causal conditions rickets comes first; and with the rickets laryngismus stridulus is often associated. Tetany appears to be closely allied to the ordinary carpo-pedal spasms so commonly met with in laryngismus. The other causal condition on which stress must be laid is the presence of gastro-intestinal irritation, and especially, it is said (though this is doubtful), of that form dependent on dilatation of the stomach; the exciting cause may be of the nature of an auto-intoxication. Certainly, however, cases do occur where rickets and nothing else can be found. In addition to the causes specified, a seasonal influence appears to exist; the disease is much more frequently observed in spring than in summer. In older children tetany is due to the same causes as in the adult; of these, cold, exhausting illnesses, debility, and gastro-intestinal mischief, are the chief. At this age the disease is not associated with laryngismus or rickets.

The **symptoms** are sufficiently characteristic. The arms become rigid and evidently painful. The fingers assume the typical position of flexion at the metacarpo-phalangeal joints, and extension at the inter-phalangeal joints, with adduction of the thumb; or, as sometimes happens, the thumb is flexed and the fingers clenched over it. The toes are curled-in to the soles of the feet, and the backs of the hands and feet are often puffy and œdematous. The tonus may involve only a part of the limbs, or it may extend to the upper arms and thighs. The spasm is tonic, not clonic, but distinct remissions occur. In older children disturbances of sensibility may be detected, and a history of premonitory subjective sensations elicited. Two additional signs are of great diagnostic value; it must be noted that they are present both during the spasm and in the latent period. They are: (1) Trousseau's symptom—the occurrence of typical paroxysms when the large arteries and nerves of the limb are pressed upon, and (2) facial irritability (Chvostek's symptom). The latter is detected by tapping on the skin over the pes anserinus, whereupon spasm of the facial muscles occurs; in slight cases it may often be best observed by percussion on the temporal region, which produces a contraction of the orbicularis palpebrarum. As in the adult, the muscles show increased electrical excitability; it may be to such an extent that an anodal opening tetanus (never observed in any other condition) is found. This sign, however, will seldom be sought for in young children. The duration of the disease is from a few days to a week or two; it almost always passes off spontaneously.

The **diagnosis** is easy. Trousseau's symptom is not always present in rachitic cases; for this reason some writers regard such as mere carpo-pedal spasms and not as true tetany. We are, however, unable to draw any hard and fast line between the two sets of cases; carpo-pedal spasms are very often associated with facial irritability, and seem to us a mild form of tetany.

The **treatment** is mainly directed against the cause, and especially against rickets. Intestinal catarrh and fermentation should be checked, and, for the spasm itself, some chloral and bromide given. Thyroidectomy is followed in many cases by tetany; for this reason thyroid extract has recently been employed in the treatment of the disease, but, except in isolated cases, has not shown itself of value.*

CHOREA.

Chorea is pre-eminently a disease of childhood, and occurs particularly during the period of the second dentition. It is rare in early infancy and in young children ; most cases occur between the sixth and the fourteenth year. Of the sexes, girls are affected about three times as frequently as boys. While previous illness, anæmia, and malnutrition predispose to its occurrence, the chief etiological factor is the rheumatic poison. Chorea may show itself before any other manifestation of rheumatism, it may occur during an attack of arthritis, or may succeed it. Further, endocarditis and other rheumatic diseases are frequent complications of chorea. Though, no doubt, the existence of the neurotic diathesis is also an important factor, in only about 40 per cent. of the cases is an hereditary tendency to nervous disease present, and in only half this number is there a previous history of another neurosis. Among the immediately exciting causes we must give the first place to mental strain, whether sudden, as from fright, or gradual, as from overwork at school. The effect of this is often markedly seen where a child after recovery from acute rheumatism is subjected to sudden excitement and forthwith becomes choreic. Some cases of true chorea are said to be due to imitation ; how far this view is correct is doubtful.

Pathology and Morbid Anatomy.—No constant morbid change has been found in the nervous systems of patients dying of chorea. It has been attributed to multiple cerebral embolism from endocarditis, but sufficient evidence of this is as yet wanting. Of the various lesions found in different cases none appear to be of great significance. Apart from the fact that its clinical features point strongly in favour of a cortical origin, nothing is known as to its pathology. Choreic movements are due to involuntary spasms of muscles, to inco-ordinate action, and to involuntary relaxation of muscles which should remain contracted. It may be pointed out that the movements of chorea (in slight cases at least) bear a very striking resemblance to those of embarrassment and shyness, and are therefore less abnormal than are the movements of epilepsy, tetanus, &c. It is not necessary to believe that exactly the same cause is at work in all cases, but we may surmise that, in very many, the cortical excitement and instability are due to the action of the rheumatic poison—whether this be of organismal nature (as there is some reason to suppose it is), or otherwise.

Symptoms.—The onset of the disease is either sudden or gradual ; the child is noticed to be restless and awkward, to be constantly grimacing, or to be knocking itself against articles of furniture. Dishes or toys carried in the hands are allowed to fall, so that, not infrequently, the chief complaint is one of loss of power. At other times the symptoms are attributed to carelessness, and punishment is inflicted, without—it is hardly necessary to say—any improvement resulting. In the ordinary case the condition is quite unmistakable; the patient is extremely restless, jerks the limbs about irregularly, nods and shakes the head, and grimaces and contorts the face. The movements of the limbs are purposeless and inco-ordinate; while the child stands, she (for it is usually a girl) shuffles her feet about the floor, twists at her dress with her fingers, and generally behaves in an extremely awkward and fidgety manner. When asked to show the tongue, the mouth is widely opened, the eye-brows raised, the tongue quickly protruded; it is as speedily withdrawn, and, as the mouth closes with a snap, may actually be wounded by the teeth. The characteristic movements are well shown if the child be asked to fasten a button, to pick up a small object, or to perform some equally delicate action. Upon more careful examination we may find that the movements are limited to one side, or—and this is what is commonly found—are more marked upon one side than the other, or in one limb than the rest. In a considerable proportion of patients, however, they are generalised; they may be so slight as almost to pass unnoticed, or so severe as to resemble a convulsion. Except in very bad cases they cease during sleep; they are diminished when the child is quiet, and are increased when she is excited, as on being watched. If the motions of one limb are controlled by the hand of the observer those of the rest become more violent. Similarly, voluntary motor acts render the jerking worse. The child can, however, to some extent control the movements.

---

* For the relative frequency of the various nervous symptoms of rickets, *vide* p. 172.

Besides affecting the head and limbs, chorea may interfere with the functions of other muscles. Thus, the respirations become irregular, chiefly from sudden contractions of the diaphragm; speech is impeded, and swallowing may be rendered difficult. Jerking and rolling of the eyes are not uncommon, but true strabismus is somewhat rare, as are also choreic movements of the laryngeal muscles. In severe cases evacuation of urine and fæces may occur involuntarily.

With the exception of the motor disturbances, few symptoms are referable to the nervous system; the muscles are firm and well nourished, but a degree of paresis is often present. The tendon reflexes are normal or slightly exaggerated, the electrical reactions are normal, and sensibility is intact, but at times there is some tenderness over the vertebral spines. The pupils are usually dilated, and slight concentric limitation of the visual fields has been described. The disposition is in most cases altered; the patient grows fretful and emotional, and has a rather vacant expression—all the more marked since chorea generally affects bright and intelligent children. The sleep is often somewhat disturbed.

Of symptoms not referable to the nervous system, the most important are those occasionally found on auscultation of the heart. Very often bruits are heard over the base and apex, especially at the mitral area, and, at times, the cause of these may not at once be manifest. Some are doubtless hæmic murmurs, the majority are due to endocarditis, while it has been suggested that, occasionally, a murmur may be caused by irregular choreic action of the musculi papillares. With regard to the last of these views, it must be said that it rests entirely upon hypothesis, and that, while in certain cases the sounds heard bear a resemblance to what one might imagine would result from a chorea affecting the heart muscle, it is probable that the bruits and irregular rhythm are, in these cases too, the result of endocarditis. Patients with chorea become rather rapidly anæmic, the temperature is seldom raised, and the excretion of urea is about normal, while that of urates and phosphates is increased. It is noteworthy that in an ordinary case the movements do not seem to fatigue the child. The other systems are healthy, and the complications most likely to occur are those of rheumatism.

Course and Prognosis.—Chorea is an almost self-limited disease. If left to themselves, most cases recover in from three to four months. Slight cases improve sooner, severe ones are more prolonged and may last for several years. The disease is very liable to recur, and may do so at such short intervals as to justify us in speaking of a chronic remitting chorea. Notwithstanding this, in ordinary cases the prognosis is good, both as regards life and as regards recovery from the disease. Acute chorea, though commoner in pregnant women, does occur in children. It resembles the type we have described, but is of a more serious nature; the patient is in constant violent motion, bruises herself against the sides of the crib, ceases to take nourishment, is deprived of sleep, and, should the symptoms continue, soon succumbs.

Diagnosis.—This can rarely be difficult. Only in hemichorea and infantile chorea must we be upon our guard lest an organic cerebral lesion be overlooked. The movements of chorea are distinct from those of all other diseases, and are readily differentiated from those of habit spasm, chorea electrica, hysteria, &c.

Treatment.—Rest is the first essential. The child should, except in the mildest cases, be confined strictly to bed for a fortnight or three weeks. During this period all excitement must be avoided, and as an additional means of soothing the patient, warm baths should be given daily. Afterwards, as the movements diminish, gentle exercise, massage, and rest in the open air are to be advised. The food should be light and nutritious—at first almost exclusively milk, though later on, fish, soups, and farinaceous substances may with advantage be added. If sleeplessness be troublesome, or if the child be extremely restless, a little bromide, with or without chloral, may be given; the state of the digestion and the bowels must be attended to, and any complication, such as anæmia, treated. As convalescence progresses, efforts should be made to induce the child to repress the choreic movements, and the parents must be instructed as to the importance of the removal of all mental stress. Under this simple treatment the majority of ordinary cases appear to progress almost as satisfactorily as when medicinal remedies are prescribed. The chief drugs on which reliance is placed are:—(1) Arsenic. This has been regarded as a specific in the treatment of chorea; it may be given in doses increasing from 3 to 10 or 15 minims of liquor arsenicalis thrice daily. If taken after meals it is well borne by children, although peripheral neuritis has been described as following on its prolonged use. Should anæmia be present, iron may advantageously be combined with the arsenic. According to Henoch, arsenious acid ($\frac{1}{130}$ to $\frac{1}{60}$ gr.) may succeed where Fowler's solution fails; further, the addition of a little opium seems, at times, to increase the action of the drug. (2) Next to arsenic we place chloral, the bromides, and—especially in the more acute cases—antipyrin. (3) Besides these, cimicifuga, the salts of zinc, conium, and hyoscyamine are a few of the many drugs which have been recommended. When other signs of rheumatism are present the salicylate of soda may be given. Of other remedial measures the warm pack, the warm bath, and the cold spinal douche appear to be of use; of the value of the ether spray and electricity we have no experience. In acute chorea, where the movements are in themselves a danger to life, a more active plan of treatment is required. The limbs should be wrapped in cotton wool and bandaged; when this is done the movements may be restrained by pinning a strong sheet round the patient. A water- or air-bed is needed, and the sides of the cot must be so thoroughly padded as to prevent the patient injuring himself more than can be avoided. To arrest the movements temporarily chloroform should be used, and followed by the subcutaneous injection of morphia or hyoscine ($\frac{1}{200}$ gr. for a child of eight), or by the administration of chloral by the rectum. The nourishment should be in the form of fluids, such as peptonised milk, soups, and beef-juice; it should be given through a feeding-cup or bottle. If swallowing be interfered with, rectal feeding must be employed. In these acute cases cardiac and general stimulants are always needed, and must be given freely. In many instances the application of cold is of value.

Finally, bearing in mind the tendency to recurrence, it is not right to allow the child to attend school until the lapse of at least three months after all movements have ceased.

SPASMUS NUTANS.

Nodding spasm is a motor neurosis which occurs in children during the period of the first dentition—usually between the sixth and twelfth months. It is thought to be associated with the eruption of the teeth, and is probably caused by the irritation produced just before the tooth pierces the gum. The child displays continuous nodding movements of the head, or movements of rotation, or of nodding and rotation combined. The motions are inconstant; they cease during sleep and when the child's attention is diverted. Such ocular disturbances as rolling of the eyes, nystagmus, or strabismus, may occur. When the head is fixed by the hand of the observer, nystagmus, if not present before, may develop, or if present may increase. From the nature of the spasm it is evident that the affection is not limited to the sterno-mastoids, but that other muscles of the neck are brought into action.

Treatment.—The movements usually cease spontaneously when the tooth appears. If persistent a little bromide may be given. In the rare cases where a central cause is present, other symptoms may develop, and the disease prove fatal.

HABIT SPASM OR HABIT CHOREA.

Children are apt to develop a "habit" of making sudden jerking movements and to acquire other tricks of expression, speech, or gesture. If uncorrected, these bad habits may persist throughout life. They may arise through imitation, or purely from habit, but many follow some abnormal condition. Thus spasm of the upper part of the face may result from a refractive error. It is often difficult to say in how far such symptoms are due to habit, and some appear to originate in a previous attack of chorea. Of the very common forms we may mention blinking the eyes, sniffing, and tricks of speech. The treatment consists in attention to the general health, and in education.

SPASMODIC WRY-NECK AND OTHER SPASMODIC AFFECTIONS OF PERIPHERAL NERVES.

Spasmodic wry-neck is due to irritation of the spinal accessory nerve, and may be unilateral or bilateral. Some reflex cause is generally believed to exist, but very often it is impossible to discover its exact nature. The muscles affected are either the sterno-cleido-mastoid or the trapezius, or both of these; sometimes other muscles of the neck, as the splenius, are also involved. Acquired non-spasmodic wry-neck is usually temporary and either due to a (rheumatic) myositis, or symptomatic of abscess in the neck, adenitis, or caries of the cervical vertebræ. Congenital wry-neck may be caused by an intra-uterine lesion, in which case it is often associated with atrophy of the corresponding side of the face; more frequently it is said to result from hæmatoma of the sterno-mastoid.

Facial spasm in children rarely involves all the muscles supplied by the seventh nerve. Here again the cause is probably a reflex one, though in some cases a central lesion has been present. Partial spasm, and in particular blepharospasm, is extremely common, the latter being in most cases due to some eye affection, such as phlyctenular keratitis.

Treatment.—Of drugs, sedatives such as opium, conium, chloral, and bromide of sodium, or nervine tonics such as arsenic and, possibly, valerianate of zinc, may be tried. Galvanism, massage, and counter-irritation are useful, or we may fall back on the resources of surgery.

In blepharospasm, which often persists long after the ocular condition which gave rise to it has passed, the best treatment is to plunge the child's face into cold water, and hold it there for a moment or two. As the child gasps the eyes are opened, and, very often, after one or two trials the spasm is overcome.

HYSTERIA.

Children are by no means exempt from the liability to hysteria. The sexes, being less differentiated, are more equally subject to the disease than is the case in later life; yet girls suffer more than do boys, and markedly increase in susceptibility as puberty is reached. Nevertheless quite young children suffer from conditions which are undoubtedly of an hysterical nature. The **etiology** is practically unknown; an hereditary taint, and mental or physical stress acting on a highly nervous temperament, seem the only recognisable factors.

Symptoms.—It is unnecessary for us to give a full account of this most protean malady. It has been said that hysteria may imitate any disease, but that it always imitates it badly. Its manifestations may be sensory, motor, trophic, or psychical; they may be combined or succeed each other in almost any conceivable manner. The best idea of hysteria is to be gained by the study of records of cases, such as are described by Henoch in his "Lectures on Children's Diseases." These seem to us to convey a more intelligible picture of the condition than does the mere description of its individual phenomena.

In a large group of cases the symptoms are psychical, taking the form of maniacal seizures, outbursts of laughter and crying, trance, &c. In others, sensory disturbances, in all respects similar to those of the adult, occur. The most common and characteristic are hyperæsthesia and anæsthesia, either unilateral or in areas irregularly scattered over the body. Hystero-genetic zones should in such cases be sought for. Among the sensory disturbances we may include the hysterical joint affections. Motor phenomena take the form of chorea magna (the so-called "saltatory movements"), or show themselves as convulsions of hystero-epileptic nature. Hysterical paralysis and spasm may occur, and so may catalepsy. Functional aphonia is one of the most common manifestations of hysteria in childhood, and is especially met with as puberty approaches.

The **diagnosis** of hysteria is often difficult. Children are sometimes brought to the physician with the history of "fits," as to the nature of which it is by no means always easy to satisfy oneself. It is usual to enquire first whether they are attended by convulsions: then—if the answer be in the affirmative—whether the child loses consciousness, or is delirious, or talks in the fit. An attempt is next made to discover the duration and nature of the seizure. When no convulsion has occurred it will often be impossible to say, from the history alone, whether the case is one of syncope, *petit mal*, or hysteria; and we can only endeavour to obtain an opportunity of witnessing an attack, or, should this be impracticable, instruct the mother as to what points she should attend to, in order the better to be able to give us a correct description of the attack. In hysterical paralysis the diagnosis may be very difficult. The absence of increase of the reflexes is one of our chief guides; a regional association of anæsthesia and paralysis is very suggestive of their functional origin.

The **treatment** in no way differs from that ordinarily employed in hysteria.

PAVOR NOCTURNUS, OR NIGHT TERRORS, AND OTHER DISTURBANCES OF SLEEP.

Like adults, children are often the subjects of dreaming, nightmare, and somnambulism. But they are also liable to a special variety of disturbance of sleep, the well-known pavor nocturnus.

It is important to distinguish ordinary nightmare from true pavor. Like the latter, nightmare may be due to such reflex causes as gastro-intestinal irritation, adenoids, &c. A child waking from a terrifying dream is alarmed, but his mind is clear and he at once realises his surroundings. On the other hand, in pavor nocturnus, properly so-called, some time elapses after awakening before the frightened child regains complete consciousness. There can be no doubt that to the omission sufficiently to recognise this distinction, a great part of the conflicting opinion as to the etiology of pavor, its prognostic import, and its relation to the other neuroses (in particular to epilepsy) is due.

Nervous and weakly children appear to be most predisposed to night terrors; digestive disorders, and especially constipation, have been blamed; the disease has also been ascribed to enlarged tonsils, adenoids, worms, bronchial catarrh, alterations in the cerebral circulation, excitement just before bed-time, and to a host of other conditions. The influence of these in the production of some cases is undoubted; in others no definite cause can be found. Children not yet arrived at the age of the second dentition are the most liable to suffer.

The nature of pavor nocturnus is uncertain. At times merely symptomatic, it may, in other instances, exist as an apparently idiopathic disease. Though the patients belong to a class in which hysteria or other trouble is apt to develop, there does not seem to be any intimate association between pavor nocturnus and this or the other neuroses. It has, however, been stated, and with some degree of plausibility, that night terrors, if not actually a species of epilepsy, may progress, as years go on, to that disease. This applies especially to cases where no cause for the condition can be found, and where the disturbance tends to recur, with exactly the same hallucination, throughout a long period of time. Though not pathognomic of any brain disorder, pavor may occur as a symptom of meningitis or cerebral tumour.

Symptoms.—The child goes to bed in its usual health ; in the early hours of the night it starts up crying with fright, and appears to be terrified at something. Very often there seems to be an alarming hallucination, such as the impression of an animal being on the bed, a man in the room, &c., and the child is so overmastered by terror as not to recognise its mother or nurse. The tears and fright continue for a quarter of an hour or longer, but gradually the child becomes conscious of its surroundings and cries itself to sleep in its mother's arms. After an attack a large quantity of pale, watery urine may be passed. When the patient awakes in the morning all recollection of what has happened is usually gone, and he seems in his ordinary health and spirits. One seizure in the course of the night is the rule, but the condition tends to recur at more or less frequent intervals, and for months the child may remain liable to pavor nocturnus.

The **treatment** of both pavor and nightmare consists in regulating the diet, avoiding overloading of the stomach before going to bed, and in carefully removing all forms of peripheral irritation, such as enlarged tonsils, adenoids, worms, &c. Any constitutional malady should also be treated. Very often no apparent cause can be found ; it is then useful to prescribe bromide of sodium, in doses of from 8 to 15 grains, to be taken at bed-time ; antipyrin, in 2- to 5-grain doses, is also a most valuable remedy. The child should neither be allowed to sleep alone at night, nor should his room be without a light, until a cure is established.

INSOMNIA.

In one respect—in its immediate result—sleeplessness is a more serious condition in the child than in the adult ; a child is very ill-fitted to withstand even a night or two of complete want of sleep. On the other hand, he is less liable than an older person to that more protracted insomnia, so little amenable to treatment, and so grave in its remoter consequences. The following are the principal causes of insomnia :—(1) A slight rise of temperature from any cause. (2) Overloading the stomach with food before going to bed, or, the opposite error, too long an interval between the last meal of the day and bed-time. (3) An ill-ventilated, over-heated bedroom, too many bed-clothes, warm feather pillows, and the like. (4) Any form of cutaneous irritation. (5) Serious disease, such as a fever or meningitis. (6) Habit. The child learns to waken regularly after being asleep for an hour or two, and will not lie quiet until after it has been taken up and carried about. The **treatment** of insomnia is usually a question of finding out and removing its cause;

when none can be discovered, or the trouble is to be put down to habit, a few doses of bromide will often effect a cure.

ENURESIS NOCTURNA.

Incontinence of urine may result from some malformation, such as extroversion of the bladder or vesico-vaginal fistula ; these will come no further under consideration.

Nocturnal enuresis is physiological in the earlier period of life, but should some degree of control over the bladder not be obtained by the end of the second year, it is to be regarded as abnormal. Wetting of the bed at night is equally frequent in boys and girls, and the children usually come under notice for the first time about the third or fourth year. The condition may be merely a continuation of the infantile state ; more often it arises at a later period, and generally after some debilitating illness. It is sometimes seen in several members of one family.

Pathogenesis.—In many cases this remains obscure, but speaking broadly, it is not difficult, when we remember how powerful is the action of the brain in inhibiting the act of micturition, to understand that in childhood where the inhibitory function is as yet imperfectly developed, urination may occur spontaneously. It is, in most instances, impossible to say exactly where the lesion is, though we may perhaps regard it as an irritable condition of the lumbar centres. In many cases a definite cause can be ascertained. Genital irritation ; disease of the urinary tract, such as lithiasis or stone ; affections of the rectum—thread-worms, fissure, &c. ; actual lesions or malformations of the central nervous system—idiocy, spina bifida, myelitis, and the like ; general diseases, such as diabetes ; distant reflex irritants—adenoids, affections of the nose and ear, intestinal catarrh, and others ; any one of these may be the cause of enuresis. Some cases are idiopathic, others are due to nocturnal epilepsy, while, in rare instances, it is associated with chorea.

Enuresis may be occasional, it may be remittent, it may occur nightly, or even more than once in the night. It takes place during the earlier hours of sleep or in the morning, may be accompanied by dreams, and seems more liable to occur when the patient rolls on to his back. Its course is uncertain ; sometimes it is speedily recovered from, at others it persists up to, though rarely beyond, puberty.

The **diagnosis** is obvious. It is important to try to discover the cause by a systematic exclusion of the various lesions to which it may be due. As a rule, the disease appears to be beyond the control of the will, and children should not be punished unless it be certain that it is due to laziness.

Treatment.—All probable causes of reflex irritation must be sought for and removed. Thus preputial adhesions, worms, ulcers of the rectum, constipation, vesical calculus, &c., must be appropriately dealt with. This will often lead to the disappearance of the condition, and in general terms it may be stated that cases brought about by reflex causes are more likely to make a rapid and satisfactory recovery than those whose source cannot be traced. Having as far as possible removed the cause, the general health of the patient demands our attention. Anæmia will often require treatment, and, for toning up the nervous system, sea-bathing, massage, and the cold douche will be found useful. The diet should be light and nourishing, and, since a large excretion of urea and urates is detrimental to the cessation of enuresis, it must not contain much nitrogenous material. No fluid should be given after five p.m., and, in addition to training the child to regular habits of urination during the day, during the night he should be wakened once or twice to micturate. Of drugs, belladonna is the most generally useful, and should be given in such large doses as to obtain its full physiological action; for a child of five, from 10 drops up to $\frac{1}{2}$ a drachm of the tincture, or even more, may be prescribed, the dose to be taken thrice daily, its effect being carefully watched. Instead of belladonna, its active principle, atropine, may be employed in doses of from $\frac{1}{100}$ to $\frac{1}{40}$ grain. Strychnine ($\frac{1}{100}$ gr.) by the mouth is sometimes of service; in obstinate cases it may be injected into the perineum. Ergotin, either by the mouth or hypodermically, has been recommended, and is supposed to control the supply of blood to the vesical centre. The passage of a sound will occasionally prove successful, and faradism, with one pole placed over the lumbar region and the other on the perineum, may bring about a cure when other means have failed.

Diurnal Enuresis.

In some cases, incontinence occurs by day as well as during the night, and occasionally is exclusively diurnal. In these instances it may be accompanied by the involuntary evacuation of the bowels. When all organic nervous lesions, epilepsy, and chorea have been excluded, and when reflex irritation has been removed, strychnine will be found the drug most generally useful in this class of cases. Belladonna may also be tried.

MIGRAINE—HEADACHES—NEURALGIA.

Migraine is by no means uncommon in young people, and should always be thought of where there is complaint of unilateral headache. Typically we find a triad of symptoms—headache, vomiting, and ocular disturbance; it must not, however, be supposed that to justfy the diagnosis it is necessary for all of these to be coexistent, since cases occur in which either headache alone, or even paroxysmal vomiting alone, alternates with, or progresses towards, true attacks of hemicrania. In general terms, the symptoms of migraine are alike both in the adult and in the child, but in the latter the headache appears to be nearly as often vertical as lateral. Temporary aphasia and hemiplegia have been described as following an attack; vertigo, and subjective sensations in the trunk and limbs are said to be frequent.

The **etiology** of the disease, like that of most neuroses, appears to lie in an hereditary predisposition, and physical or mental strain. In some cases the correction of an error of refraction has removed the disease. The exact pathology of migraine is, however, very obscure; it has been regarded as a sensory epilepsy.

The **diagnosis** rests on the triad of symptoms, and especially on the unilateral or vertical headache, recurring paroxysmally without apparent cause. Doubt may for some time exist as to whether the case is really migraine, and not an organic cerebral lesion.

The **treatment** is a matter of difficulty, and too often proves unsatisfactory. Apart from the remedies appropriate to any such concomitant disease as anæmia, the avoidance of overwork and other causes which appear to induce an attack, and general dietetic and hygienic regimen, we have found most benefit from the use of small doses of euonymin and blue pill given every second or third night. This not infrequently appears to ward off the attacks, or, at least, to render them less severe; should it fail, a course of bromide is often beneficial. During the attacks, phenacetin, antipyrin, or caffeine may be tried; at times one seems of value, at times another, but, on the whole, phenacetin is perhaps the most generally useful. Cannabis indica has been highly praised, and, on the supposition that migraine is due to unilateral spasm of the intracranial blood-vessels, nitroglycerine is often given. Many other nervine sedatives will suggest themselves as being worthy of trial. Ocular defects, if present, should be corrected, and any lesion likely to set up reflex irritation ought certainly to be treated.

HEADACHES.

The treatment and cure of an ordinary headache will often tax the ability of the physician to its utmost. Except in the case of migraine we have not been able to trace any very definite connection between the locality of the pain and its cause, and, possibly on account of the difficulty of obtaining any precise description of it, we have not found the character of the headache of any great diagnostic value. It is most convenient, then, to consider the subject in relation to the principal conditions with which it is associated. As regards the history, the chief point on which it is well to assure oneself is whether the child is subject to headache, or whether we are merely dealing with an isolated attack.

One of the most common causes, then, of repeated headache appears to be anæmia and debility. Here the pain seems often to be worst in the morning or forenoon, and the child is usually pale and ill-nourished. In another large group of cases overwork at school is certainly to blame; here also the children are often anæmic; the state of the refraction should be enquired into, as well as the amount of exercise taken at school, the ventilation of the school-room, &c. A third great cause of headache is undoubtedly gastro-intestinal disturbance, acute or chronic. In the latter case there is frequently anæmia and malnutrition; the headache is often frontal.

From a clinical point of view these are the chief conditions in which headaches, as such, claim special treatment. We must remember, however, that they may be due to many other causes, though often assuming merely a subordinate place as symptoms. When a child who is not subject to them complains of pain in the head, it is well to examine the throat and to take the temperature. Most febrile conditions give rise to headache, and should the temperature be raised we have to ascertain the cause of this in the usual manner. Uræmic, rheumatic, and other toxic headaches; and those due to brain disease, to ear disease, to reflex irritation, and to ocular insufficiency, have also to be mentioned. The refractive error most commonly producing headache is hypermetropia or hypermetropic astigmatism. The pain is frontal, and is increased by reading, or straining the eyes in any way.

In the **treatment** of the anæmic headache, rest seems to be one of the most important factors. The child should be allowed to lie down in a quiet darkened room when the headache is troublesome; this, with tepid sponging, good nourishing food, moderate exercise in the fresh air, and the usual treatment of anæmia, often works wonders. In cases apparently due to over-strain, lessons should, for the time being, be diminished or abolished, and fattening food, moderate open-air exercise, and tonics be ordered. The necessity for the treatment of any accompanying dyspepsia or constipation is obvious. In more purely symptomatic headaches the cause must be sought for and relieved. In ordinary cases it is not very often necessary to give sedative drugs to relieve the pain, though, if desirable, such remedies as the bromides, antipyrin, and phenacetin may be tried. It is usually, however, better (as some medicine must, as a rule, be prescribed) to order a simple tonic or constitutional remedy, and to trust by rest, diet, cod-liver oil, and gentle exercise, to improve the general health of the patient. In obstinate cases the refraction should be tested.

NEURALGIA.

With the exception of neuralgia of the fifth nerve, most commonly the result of carious teeth, this is not so important a disease of childhood as of adult life.

CHAPTER XVIII.

DISEASES OF THE NERVOUS SYSTEM (*continued*). ORGANIC.

Contents.—Inflammation of the Meninges of the Brain—Infantile Cerebral Paralysis—Hereditary (Spinal) Spastic Paralysis—Vascular Disturbances in the Brain—Chronic Hydrocephalus—Meningocele and Encephalocele—Spina Bifida—Tumours of the Brain—Aphasia and other Speech Defects—Acute Anterior Poliomyelitis—Progressive Muscular Dystrophies—Birth Paralyses of Peripheral Origin.

INFLAMMATION OF THE MENINGES OF THE BRAIN.

(1) TUBERCULAR MENINGITIS.

ON account of its frequency, its practically invariable fatality, and the indefiniteness of its earlier symptoms, tubercular meningitis is one of the most important diseases with which the physician has to deal. Though occurring in adult life, it is essentially a disease of youth, the vast majority of the patients being children between the ages of six months and eight or nine years. Before the second year, however, it usually forms only a part of an acute miliary tuberculosis. Tubercular meningitis may develop as an apparently primary disease —primary, that is, in so far as the existing tuberculosis has not given rise to symptoms demanding medical advice. In another group of cases, it complicates (and terminates) some other malady, such as phthisis, abdominal tuberculosis, or bone disease.

Pathogenesis and Morbid Anatomy.—It may be doubted whether the meninges are ever the primary seat of the tubercular infection. In by far the greater number of cases some lesion is found elsewhere, and it must be remembered that it is extremely difficult, even by *post-mortem* examination, to assure oneself of the complete absence of tubercle from other viscera ; to do so means that all the glands, the marrow of all the bones, as well as the joints, &c., must be examined, a proceeding which is a practical impossibility. Meningitis, then, being secondary, we usually find it arising in children who are hereditarily predisposed to tuberculosis, or who have suffered from some such debilitating disease as measles or whooping-cough. In these the meningeal infection not infrequently takes origin from a caseating gland at the root of the lung. Phthisis, tabes mesenterica, ulceration of the intestine, tubercular processes about the nose and ear, bone and joint disease, and (a lesion perhaps rather apt to be overlooked) tuberculosis of the uro-genital tract, are among the most frequent sources of infection. In most cases the organism appears to reach the brain by the general circulation ; if carefully sought for, a caseating gland can sometimes be demonstrated to have ruptured into a pulmonary vein. It has been suggested that, in some cases, infection takes place by way of the sheaths of the spinal nerves. The lesion affects the base of the brain to a greater extent than the convexity ; it consists of two elements, the miliary tubercle and the inflammatory exudation, of which at times one, at times the other, predominates. The miliary tubercles are found along the course of the vessels, the exudation is seen as a more diffused, greenish-yellow, gelatinous material covering the surface of the brain. The localities most affected are the parts lying about the chiasma and pons, the fissure of Sylvius, and the surface of the cerebellum. The fluid in the ventricles is usually in excess of the normal amount, and the sulci and gyri are, in consequence, flattened. The meninges of the cord are also very often affected.

Symptoms.—It is customary to regard the disease as divided into stages : a prodromal period, a stage of irritation, a stage of commencing compression, and a stage of paralysis and coma. Although these can be to some extent recognised, the distinction between them is by no means absolute, and irritative and paralytic symptoms often occur simultaneously. Without strictly adhering to this order we shall, as far as may be, take up the phenomena in their usual sequence. While, at times, the onset is abrupt and the course so rapid as to suggest an acute meningitis (in these cases, be it noted, the lesion is frequently vertical rather than basal, and is often due to the breaking down of a tubercular cerebral nodule), it is the rule to find that the child has been out of health for several days or weeks. Loss of appetite, disinclination for play, drowsiness, with startings from sleep, harshness of the skin, slight feverishness, fretfulness or more marked alteration in disposition, constipation, and, not infrequently, vomiting, are the characters of the initial stage.

Then more marked symptoms develop. Headache is complained of, usually frontal, persistent, and tolerably severe. In young children this is not always to be made out ; the patient complains rather of pain in the throat and belly. With the headache we have vomiting and constipation. The conjunction of these last two symptoms always arouses suspicion ; vomiting due to gastric disturbance is usually accompanied by diarrhœa ; the constipation in meningitis may be so marked as to give rise to the idea that there is obstruction of the bowels—indeed, cases are not uncommonly sent into hospital with this diagnosis, and it is only when further symptoms develop that their nature is revealed. In practice, the characters of the vomiting will be found of little aid. In children the act is, as a rule, accompanied by little nausea or retching; the distinctive features of cerebral vomiting are therefore unreliable. It may, however, be observed to occur when the patient sits up in bed, and quite irrespectively of the taking of food ; on these points due stress should be laid. In addition to these symptoms, the child, if old enough, may complain of giddiness, and of being distressed by noises, bright lights, and external stimuli generally. In younger children this sensitiveness is shown by the curled up position, boring of the head under the bed-clothes, and turning away from light. Picking at the lips and rubbing at the eyes are frequently observed. The tongue is coated, the temperature moderately raised, the pulse quickened, and the pupils contracted.

So far, the symptoms are not characteristic ; but, usually by the middle of the first week, others are added which render the diagnosis clear. The pulse becomes slowed, the rhythm irregular, and the beats of unequal size. These changes in the pulse are decidedly significant : while irregularity is not uncommon in other diseases, irregularity with retardation of the beats to 90 or 70 is rarely met with apart from tubercular meningitis. On the other hand, constant regularity of the pulse is a sign which should weigh considerably against the diagnosis of this disease. The breathing becomes sighing, deep gasping inspirations are heard during sleep, and these (which may occur before the character of the pulse has been such as to attract attention) are very suggestive of cerebral mischief. An early symptom, and one not without importance, is retraction of the abdomen. At first slight, this goes on until the abdominal walls slope directly back from the costal margins to the spine, and give rise to the true scaphoid or "boat-shaped" abdomen.

As time goes on the patient emaciates rapidly, the vomiting and constipation persist, and the drowsiness increases, but is disturbed by delirium and screaming. The so-called "hydrocephalic cry" is of little diagnostic worth. It is noticed that the trophic functions are altered ; impetiginous eruptions, which may have existed for months, dry up, obstinate diarrhœa may cease, and glandular enlargements subside. *Taches cérébrales*, flushings of the skin persisting for some little time after irritation, are of no practical importance. Symptoms of affection of the cranial nerves then begin to appear ; ptosis, strabismus, and facial paralysis are not uncommon, the head is retracted, the neck rigid and often tender, but extreme opisthotonos is rare. The pupils begin to dilate, react sluggishly to light, and may be of unequal size. The cutaneous reflexes are diminished, the tendon jerks increased. General or local convulsions ensue, but are, so far as the localising of the lesion is concerned, of little diagnostic value. As coma deepens, paralysis will, as a rule, be found ; it may be hemiplegia, more often is a monoplegia ; it may be flaccid or spastic, or one arm may be rigid while another is relaxed. The pupils dilate widely and become insensitive to light, the conjunctival reflex is abolished, mucus and Meibomian secretion collect between the motionless eyelids, and the cornea becomes hazy. If the fundus be examined swelling of the optic disc or papillitis may be found ; tubercles of the choroid are inconstant and somewhat difficult of detection. The pulse becomes more rapid and feeble, but is less irregular ; the breathing often assumes the character of typical or modified Cheyne-Stokes respiration ; flushing of the face and copious, sometimes unilateral, sweats occur. The organic reflexes are involved ; the urine may dribble, but is more often retained ; if, on passing a catheter, none can be drawn off, we must conclude that there is actual suppression. It may be noted that the power of swallowing is late in being abolished ; even when the child is deeply comatose the act may be well performed. In an ordinary case death occurs about the end of the third week, and is often preceded by severe convulsions. A feature which from its striking character, more than from its frequency, merits special notice, is that transient recovery of consciousness—the waking for a time from deepest coma and the recognising of friends and parents—which is met with in a small proportion of cases, and arouses hopes foredoomed only to disappointment. Whilst the average duration of a case of tubercular meningitis is from three to four weeks, it may be shorter or longer, and, in some instances, the symptoms remit and only recur after a considerable interval of health. In a few cases the onset of the disease is very different, being sudden and accompanied by hemiplegia and unconsciousness. The child may never recover from the coma, or, after a temporary improvement, may develop the usual symptoms of meningitis. The temperature during the disease is by no means characteristic. It is usually moderately febrile, rising to 101° or 102° Fahr. in the evening, and falling a degree or so in the morning. In some cases it remains normal throughout. Very constantly, however, a pro-agonic rise occurs, the thermometer registering 106° or 108° Fahr. at death, and perhaps a degree higher during the succeeding half-hour or hour.

In the **differential diagnosis** of the tubercular form of meningitis the path of the physician abounds in pitfalls. The diseases most resembling it are :—(1) Gastric catarrh. Here the symptoms referable to the stomach are more prominent, and there is often diarrhœa ; the pulse, though at times irregular, is practically never also slowed ; the temperature is of little diagnostic value. (2) Obstruction of the bowels. The constipation in meningitis is less absolute, the abdomen is retracted or, at least, not tympanitic, the other symptoms developing show the nature of the case. (3) Enteric fever. In treating of this disease we shall mention that it is not infrequently associated with nervous symptoms and constipation. Although marked, the latter is less obstinate than in meningitis, the temperature is more regular, the tongue has a more febrile appearance, the abdomen is tumid, there is almost always some bronchial catarrh, the spleen is enlarged, and the rose spots may be present. (4) Other forms of meningitis. Of these we shall speak later.

The **prognosis** is, it need hardly be said, absolutely bad as soon as the nature of the disease is certain. Practically the only gleam of hope lies in the possibility of an error in the diagnosis. But, undoubtedly, some cases presenting all the features of tubercular meningitis have been known to recover.

(2) ACUTE (PURULENT) MENINGITIS.

Except by considering the course of the disease, it is, clinically, quite impracticable to distinguish between a simple and a purulent meningitis. Cases which recover spontaneously (without surgical interference) may be regarded as simple; in those which come to the *post-mortem* room the meningitis is, as a rule, purulent.

Pathogenesis and Morbid Anatomy.—Acute meningitis may ensue in the course of an infectious disease such as typhoid, pneumonia, endocarditis, or septicæmia. It may result from comparatively slight trauma or from fracture of the bones of the skull. An important group of cases is included under the epidemic form of cerebro-spinal meningitis; to these we refer in another place. Sunstroke is said to cause meningitis; its relation to it is somewhat doubtful. By far the most frequent cases are those consequent on the spread of inflammation from some adjacent structure, and in a large proportion of them disease of the middle ear or mastoid is the source of infection. Panophthalmitis and purulent rhinitis are much less frequent causes, and the same may be said of erysipelas of the scalp.

The **symptoms** of meningitis have been so fully dealt with in the preceding paragraphs that, further than to point out the distinctive features of the acuter form, little need be said here respecting them. It will be remembered that, while tubercular meningitis is basal, acute meningitis mainly affects the convexity. Bearing this in mind, as also the more acute nature of the process, the symptoms will be readily understood. The onset is sudden, with headache, prostration, vomiting, and vertigo. The patient is listless, drowsy, and irritable, cutaneous hyperæsthesia is common, and other signs of cerebral irritation are present. The temperature is usually high, 102° to 104° Fahr., and rigors may occur; the pulse is at first rapid, becoming retarded and irregular later. Motor phenomena are early and important symptoms; unilateral or bilateral convulsions, paralysis of one or more extremities, with tonic or clonic spasms, soon appear. The cranial nerves become affected; ptosis, strabismus, mydriasis followed by myosis, papillitis, and (rarely) choked discs, are some further signs of acute meningitis. In most cases there is some retraction of the head; and, as coma deepens, the sphincters become involved, and urine and fæces are passed involuntarily. The remaining features of this disease differ chiefly from those of the tubercular form in being referable to vertical, rather than to basal, lesion.

Diagnosis.—The error most likely to be committed is to imagine that the nervous symptoms—the headache, delirium, and convulsions—so frequently present at the onset of infectious diseases, are due to meningitis. Such a diagnosis is only permissible when, in addition to them, we find some of the other signs mentioned above—rigidity of the neck, paralysis or localised convulsions, or fundal changes. The absence of leucocytosis in enteric fever, and its presence in purulent meningitis, may at times assist the diagnosis. A condition which especially in a child may prove very perplexing, is that of acute suppurative otitis media. In such cases headache, delirium, vomiting, convulsions, vertigo, and even optic neuritis may at times be observed. In cases with a history of middle-ear disease, there is often doubt as to whether a cerebral abscess or a purulent meningitis is present. In the former the fever is less, the temperature may even be subnormal, occasional rigors occur, and the pulse is comparatively slow ; the signs of irritation of the cranial nerves and the retraction of the head are usually absent. The differential diagnosis is often one of extreme difficulty, and, in view of the different prognosis and treatment of the two conditions, it is also of great importance. Uræmia is scarcely likely to occur during childhood in such a form as to simulate meningitis. The recognition of the disease under consideration, then, depends on the discovery of a cause, with the presence of meningitic symptoms pointing to involvement of the vertex.

Though bad, the **prognosis** is less unfavourable than in tubercular meningitis ; it depends in no small degree upon the source of infection. In meningitis occurring in a disease where the absence of pyogenic organisms can be inferred, the prognosis is better than when a septic origin is probable.

(3) SIMPLE BASAL MENINGITIS.

In a rather small group of cases, in which one of the chief symptoms is persistent cervical opisthotonos, *post-mortem* examination reveals a simple, non-purulent meningitis, limited to the base of the brain.

Pathogenesis and Morbid Anatomy.—The etiology of the condition is as yet imperfectly known. Dr. Still has recently described a diplococcus, identical with the diplococcus intracellularis of Weichselbaum, as occurring in the meningeal exudate and in the fluid of the synovial sheaths. On this account he regards the disease as a sporadic form of epidemic cerebro-spinal meningitis. In some cases there is a history of accident, in others disease of the cranial bones has been present. Basal meningitis affects infants and young children during the first two years of life, but, although sometimes of congenital and apparently ante-natal origin, there does not appear to be any family proclivity. Syphilis has been regarded as an important factor. The inflammation of the pia is more limited in area than in the case of tubercular meningitis ; it extends from the optic chiasma to the medulla and roof of the fourth ventricle, but does not spread laterally along the fissures of Sylvius. An essential feature of the change appears to be an occlusion of the foramen of Magendie by the adhesion of the lobes of the cerebellum to one another and to the walls of the fourth ventricle. In a few cases the cerebellum is less involved, and there is simply a fibrous membrane stretching over and obliterating the foramen. Resulting from the closure of this opening, the outflow of the cerebro-spinal fluid is interfered with, the ventricular system becomes dilated, and, by their downward growth, the distending third ventricle and infundibulum come to press upon the optic chiasma, and cause more or less complete blindness.

Symptoms.—The course of the disease is chronic, usually lasting for about two months. As has been said, cervical opisthotonos is one of the most important symptoms. The head may be bent backwards to a right angle with the spine; in extreme cases true opisthotonos with involvement of the muscles of the back may occur. Tonic or clonic convulsions, rigidity, increase of the tendon reflexes, strabismus, and nystagmus are often present; vomiting is common. The temperature is febrile, seldom normal throughout, and in most cases coma terminates the patient's existence. Among the less constant symptoms may be noted: optic neuritis, only present in a minority of instances; dilatation of the pupils; and, towards the end, blindness. The other special senses are seldom involved. The bowels may be confined or act naturally; abdominal retraction is not marked. Though often irregular, the pulse and respiration show less departure from the normal than in tubercular meningitis.

Prognosis.—The disease appears to be invariably fatal.

Differential Diagnosis of the various forms of Meningitis.—In **tubercular meningitis** the special points on which reliance is placed are these:—The gradual onset, with symptoms referable to basal lesion, the presence of tubercle elsewhere, the emaciation, the irregular temperature curve, the great retraction of the abdomen, the absence of leucocytosis, and the presence of tubercle bacilli in the fluid obtained by lumbar puncture.

In **acute meningitis** the sudden invasion, the presence of an exciting cause, the high temperature, the fact that the symptoms point to a vertical lesion, the presence of leucocytosis (in cases where pus is present), and the bacteriological examination of the cerebro-spinal fluid, are of value in a doubtful case.

In **basal meningitis** the extremely chronic course, the very irregular type of the fever, the age at which the disease occurs, the marked opisthotonos, and the absence of tuberculosis and other infective lesions, are sufficiently characteristic.

Cerebro-spinal meningitis is characterised by its epidemic occurrence; apart from this its recognition is not easy. The presence of herpes or other cutaneous eruptions, and the discovery of the diplococcus in the cerebro-spinal fluid, would simplify the diagnosis.

Should a disease presenting many of the features of tubercular meningitis occur in a child the subject of congenital syphilis, and should recovery ensue under appropriate anti-syphilitic treatment, the presumption of a **syphilitic meningitis** would arise.

Treatment of Meningitis.—In cases of meningitis the patient should, as far as possible, be shielded from all external stimuli; the room should be darkened and kept as quiet as may be. The bowels should be freely moved by a calomel purge followed by a saline, and a movement should subsequently be secured, either by aperients or by enemata, on every alternate day. The food must be light but nutritious—milk being the staple diet. Should nourishment be rejected by the stomach it must be administered by the bowel; the same will apply to medicines. The head should be shaved and an ice-bag or Leiter's coil applied; leeching behind the ear can seldom be harmful, but blistering and strong counter-irritants in general are better avoided. For the vomiting, bromide and hydrocyanic acid, ice, and the application of mustard poultices to the epigastrium are the best remedies. Sedatives are almost always required; of these, the bromides combined with chloral, and opium cautiously used, are the most reliable. If very high the temperature should be reduced, preferably by sponging; apart from this, antipyretics are unnecessary. To subdue the convulsions, chloroform may be required.

In tubercular meningitis it is too much the custom to regard all treatment as hopeless; yet at the worst we can alleviate the symptoms by the measures suggested, and it must not be forgotten that the use of iodides and mercurial inunction is said to have been attended with benefit. Of surgical treatment little can be said. Lumbar puncture, of which great expectations were formed, has proved almost, if not entirely, useless; trephining has shown itself no more successful. At the same time, an occasional case has been reported where all the symptoms of a meningitis have been relieved, and a cure has apparently resulted from the opening of the skull. Drainage of the fourth ventricle has, we believe, been tried in some cases. The surgical treatment of basal meningitis is on the same lines, though here the prospect of a cure appears better.

INFANTILE CEREBRAL PARALYSIS.

Under this name is comprehended a large group of cases presenting the most varied clinical appearances, but agreeing in so far that they are due to a cerebral, not to a spinal lesion. The term is not a strictly accurate one, inasmuch as, on the one hand, many paralyses due to brain disease are excluded; examples of these are—the paralyses occurring in cases of tumour, in hydrocephalus, and in meningitis. On the other hand, we include under the name cases in which paralysis is by no means a marked feature, but where choreiform movements, spastic rigidity, or epilepsy, may be the dominant characteristics.

Cerebral paralysis, using the word in this wide sense, may be due to causes acting *in utero*, to causes acting during parturition, or to causes acting after birth and (in most cases) before the third year. They are then ante-natal, natal, or post-natal. Since, however, it is often clinically, and occasionally even pathologically, impossible to assign a given case to any one of these divisions, it is more convenient to consider the cases as divided into two great classes—the hemiplegias and the diplegias. Of these the former are about twice as common as the latter; cerebral monoplegia—an extremely rare affection—comes under the first head, cerebral paraplegia, which is much more common, under the second. The symptoms of cerebral lesion in the child differ from those in the adult mainly in detail, and the differences are to be referred to the special nature of the lesion, which not infrequently involves both hemispheres; to the fact that it affects an undeveloped brain; as well as to the fact that the results are manifested upon a growing body, as opposed to one more or less mature.

HEMIPLEGIA.

Symptoms.—Though at times congenital, hemiplegia is more frequently seen as an acquired condition, and usually occurs before the third year, though its first appearance may be as late as the ninth. The onset may be attended with such severe general symptoms as are met with in infantile spinal paralysis, and, if marked, these for the time being render the diagnosis impossible. In the midst often of perfect health, fever, vomiting, convulsions, and sometimes coma, suddenly set in, and last for a day or two or even longer. These initial symptoms are present in about two-thirds of all cases, and one of them, the convulsion, merits special notice. It may be epileptiform or it may be unilateral, it is almost always attended by loss of consciousness, and, in some cases, as soon as the seizure is past, the child is found to be hemiplegic. In other cases the paralysis is more gradually developed, and in others again—the importance of these from an etiological standpoint will be considered later—it is only after a series of fits, at intervals of weeks or even months, that hemiplegia is discovered. If the general initial symptoms be entirely absent, the first sign of the disease is the sudden paralysis of one side of the body.

Hemiplegia is somewhat more often right- than left-sided. As in the adult, the arm and leg suffer most, the face less, while the trunk muscles escape. The hands and feet suffer more than the proximal parts of the limbs; consequently, fine movements are more affected than coarse ones. As in ordinary hemiplegia, the leg recovers before the arm; but, in children, the facial muscles are more extensively involved than in the adult, a moderate degree of affection of the upper branches of the seventh nerve being rather the rule than the exception; at times even a spastic facial paralysis is present. Ocular paralysis is rare, and belongs as little to typical hemiplegia in the infant as in the adult; it is usually due to a lesion of the crus. Lateral hemianopsia is not very infrequent, but other sensory defects are, as a rule, absent. In some cases aphasia occurs; it is at present only necessary to note that this is always motor in type—Broca's aphasia—and that it is by no means invariably associated with right, but often with left hemiplegia, a fact probably to be explained on the ground that the left half of the brain has not, as yet, acquired that importance which it possesses at a later period. The aphasia is usually incomplete and is readily recovered from, the right convolutions appearing to adapt themselves readily at this age to acting as the centres for speech. In young children all that results is a delay in the acquiring of spoken language; and to this, interference with articulation (dysarthria) may contribute.

In connection with the paralysis a very important train of symptoms gradually becomes apparent. These are spasms and contractures, post-hemiplegic choreiform movements, trophic changes, epilepsy, and mental defect.

Spasms and Contractures.—At the very first the paralysis may be a flaccid one, but it soon becomes spastic, with increase of the tendon reflexes—an increase which may spread to the sound side. True contracture comes on gradually, and the arm and leg assume the position common in ordinary hemiplegia; clubfoot—pes equinus or equino-varus—is often produced. The contractures are to some extent abolished by voluntary movement; they do not absolutely coincide with the paralysis—the elbow may be fixed to a greater degree than the fingers, though the latter are the more paretic. As the paralysis disappears the contractures may improve, or they may remain after it is to a great extent recovered from.

Post-hemiplegic movements form an extremely important group of symptoms. They are met with in a far greater proportion of the hemiplegias of infancy than of those of adult life, and occur either with voluntary muscular actions or spontaneously. Under the first head we recognise that the ordinary movements of the child may be spastic; they may, on the other hand, be ataxic, groups of muscles other than those intended being thrown into action. Further, in extreme cases, where muscular jerking is great, they may actually become choreiform. These ataxic and choreiform movements, accompanying voluntary motor acts, are quite peculiar to infantile cerebral paralysis. In addition to these, associated movements (motions of the paralysed limb in imitation of the sound arm or leg) may occur. Spontaneous movements are often choreiform; they may commence after the paralysis is partially recovered from, and when only a spastic paretic condition remains; they may develop earlier, along with the onset of spasm, or they may affect one extremity only, the other becoming markedly spastic. Lastly, in a certain series of cases, a hemichorea may precede the hemiplegia. The post-hemiplegic disturbances, however, do not invariably take the form of chorea; typical athetosis is found in some cases; in others, a rhythmical movement resembling an exaggerated athetosis, but quicker and less continuous, is present.

Trophic Changes.—*A priori* we should hardly expect that a cerebral lesion would produce any considerable changes in nutrition: it must, however, be borne in mind that it affects not a fully-grown, but a growing, organism. The patient, therefore, has often a stunted appearance. Should the brain have become in part atrophic, as often results from the lesion, the skull will show signs of asymmetry, and—corresponding with the defective growth of the vault—the face may be smaller on the one side than on the other. This asymmetry must not be confounded with progressive facial hemiatrophy. These cranial changes take place only if the disease begin before the third year. The muscles of the paralysed limb usually become slightly atrophic, and the growth of the limb itself is interfered with; shortening, however, rarely exceeds one inch, and does not become apparent before the time of puberty. In addition to being wasted the paralysed limbs are colder than normal. There is never any reaction of degeneration. If choreiform movements are marked it sometimes happens that the paralysed muscles hypertrophy, and become firm and hard.

Epilepsy occurs in almost all cases. As has been mentioned, a series of convulsions may precede the paralysis, and these fits may continue throughout life. As a rule, however, epilepsy does not manifest itself from the onset, but is delayed until a period of one or two years has elapsed; this latent period may be shortened by various emotional causes, for example, fright. The seizures are less severe than those of idiopathic epilepsy: there is usually an aura; the cry, the biting of the tongue, and the evacuation of the bladder are absent. In some cases the fits are unilateral and approach Jacksonian epilepsy. As time goes on, however, they become more severe, and indistinguishable from the ordinary *grand mal.*

Mental Condition.—This varies from an average degree of intelligence to a state of hopeless idiocy. Hemianopic cases are often bright and of fair ability. The epilepsy has the usual effect of impairing the mental powers.

It will be seen that infantile hemiplegia resembles the adult type; but that, influenced by the immaturity of the organism, it results in the development of additional features—extreme spasm, constant occurrence of choreiform and other involuntary movements, epilepsy, trophic changes, and mental impairment.

To complete a survey of the symptoms two special types may be mentioned. As has been said, hemichorea may precede paralysis, and in such cases the disease has been named **choreic hemiplegia.** This usually commences at a somewhat late period—in children over three years; it is rarely complicated by aphasia, trophic changes, idiocy, or epilepsy; a history of fright is often obtainable. In another variety, paralysis and contracture are absent, and the only symptom is retarded growth on one side of the body. Such cases are occasionally associated with **hemianopsia.**

As regards the **course** of hemiplegia, it may be said to be rarely directly fatal, though, as a rule, the duration of life is below the average. Death occurs during the initial stage, or from the later epilepsy. Paralysis may disappear within a few days from its onset, may persist longer, or remain permanent. Recovery is most complete in the face; the leg usually improves sufficiently to enable the patient to walk about; the arm is often permanently paralysed. As chorea develops, it proves much more disabling than either paresis or contracture. It varies greatly in severity, and nothing is known as to its ultimate result.

Diplegia.

While hemiplegia is usually acquired, and shows comparatively little variation in its symptoms, diplegia manifests itself under very various forms, and is almost always congenital. Notwithstanding this, it is impossible to regard the period of origin of the two conditions as in any way a basis of distinction between them—hemiplegia may be congenital, diplegia acquired.

One of the most important clinical varieties of diplegia is that known as "Little's disease," or **general spastic rigidity.** This dates from birth, or may only be noticed a few weeks later; there is so much contracture that the body is rigid and board-like, the legs, and especially the adductor muscles, being in a state of extreme spasm. Compared with the contracture, paralysis and chorea are insignificant, but intelligence and the acquiring of speech are almost invariably much affected. Walking is either impossible or learned late, and may take the form of cross-legged progression.

In another group of cases the arms are spared, and the legs only involved; to these, according as the spasm or paralysis is predominant, the name of **spastic paraplegia** or **paralytic paraplegia** is given. There is usually some further sign of intra-cranial mischief, such as defect of intelligence or squint; and in the absence of these it may be impossible to say whether a case is of cerebral or spinal origin.

Occasionally we see (to use a contradiction in terms) a **bilateral hemiplegia.** In such a case the muscles supplied by the cranial, and particularly by the seventh nerves, are much affected; the paralysis also involves the paired muscles of the trunk.

In another series of cases post-paralytic movements are the marked symptoms; such are cases of **general infantile (congenital) chorea** and **bilateral athetosis.**

In addition to the types described transitional forms occur.

In diplegias the skull is asymmetrical or otherwise abnormal, and owing to interference with mimetic movements the face is expressionless. Ocular affections are more frequent than in hemiplegia; optic atrophy, nystagmus, and strabismus may occur. Deafness is rare; disturbances of common sensibility are not easy of detection. Pseudo-bulbar symptoms, such as dysarthria, regurgitation of food, dysphagia, defective movements of the tongue, &c., have been noticed. The motor changes are very like those which have already been described in speaking of hemiplegia; one phenomenon is seen, however, which is absent from that disease. This is the assumption of "forced attitudes." These are complex co-ordinate positions not entirely due to contracture; they can be voluntarily departed from, but when the influence of the will is withdrawn they again recur. A common form is the so-called "begging attitude," in which the arms are extended at right angles to the body, and the hands are fully supinated. Otherwise the changes in diplegia are, *mutatis mutandis*, much the same as in hemiplegia, and though the duration of life is as a rule shorter, the course of the malady is even more uncertain and variable than in that disease.

Etiology and Pathology of Cerebral Paralyses.—As we have stated, the cerebral lesion may be of intra-uterine origin, it may occur during parturition, or it may be acquired in after-life. The etiology of congenital cases is obscure. It is frequently impossible to assert definitely whether they are ante-natal or natal, though we must add that some authorities regard absence of proof of difficult parturition as presumptive evidence of an intra-uterine origin. The chief causes of lesion *in utero* are injuries to the gravid uterus, and acute illness, cachexia, and psychical disturbance on the part of the mother. Syphilis, a neurotic heredity, and alcoholism are of doubtful influence in its production. During birth, cerebral paralysis may be brought about by any undue pressure upon the head, especially if this be combined with asphyxia. Thus, prematurity, abnormal positions of the head, breech presentations, and prolapse of the cord appear at times to bring it about. The use of forceps does not seem directly to blame, but rather the abnormal condition necessitating forced extraction. With regard to paralyses beginning after birth, much obscurity prevails. In many cases they occur during the course of some infectious disease, such as scarlet fever, measles. whooping-cough, diphtheria, tonsillitis, rheumatism, endocarditis, &c., and have even been described as following vaccination. Strümpell believes that in some instances the lesion may be of the nature of an acute inflammation of the cerebral cortex, analogous to acute anterior poliomyelitis ; but, though the general course of some cases seems to support such a view, no anatomical evidence of its correctness is, as yet, forthcoming. A certain number of cases can be attributed to fright and some to trauma. In cases where the fits have, for some time, preceded the paralysis, the position of the epilepsy in respect to the etiology comes to be an important question. It may plausibly be argued that recurrent convulsions, by producing hæmorrhage or repeated congestion, may lead to such a gross lesion as will cause paralysis. On the other hand, it is equally obvious that both epilepsy and hemiplegia may be due to the same cause, and to this view the balance of the evidence seems to point. Without going into further detail as to the probable causes of the various types, we may again repeat that most hemiplegias are post-natal, diplegias natal or ante-natal.

Morbid Anatomy.—So varied are the *post-mortem* changes, and (except in distribution) so little are they related to the clinical picture that it is impossible here to describe them at length. The initial lesion may be a trauma resulting in meningeal hæmorrhage ; asphyxia resulting in venous congestion and rupture of capillaries ; or it may primarily be a vascular change—a cerebral hæmorrhage, embolus, or thrombosis. Finally, some cases appear to be due to a primary encephalitis. The ultimate changes are indicated in the following table :—

Intra-uterine,	Porencephaly. Defective development of the pyramidal tracts. Cortical agenesis.
Birth Paralysis,	Meningeal hæmorrhage, less frequently intra-cerebral, resulting in chronic meningo-encephalitis, cysts, and atrophy.
Acquired,	Thrombosis. Meningeal, less often intra-cerebral hæmorrhage. Embolus. Resulting from these: cysts, atrophy, chronic meningitis. Chronic hydrocephalus (rarely the sole cause). Acute polioencephalitis. [*Sachs.*]

Diagnosis.—In well-marked hemiplegia the diagnosis is obvious, and this is also the case in most forms of diplegia. When the legs only are affected, and cerebral symptoms are absent, it will often be impossible to make a diagnosis between a cerebral and a spinal lesion. True cross-legged progression is in favour of the latter; its absence does not prove the converse. During the acute initial stage the diagnosis is usually impossible. The error into which the physician is most likely to fall, is the failure to recognise slight degrees of paralysis in cases where the choreic movements or epilepsy predominate. A careful examination of the limbs, and especially of the tendon reflexes, taken along with the history, will suffice for the avoidance of such a mistake. In some instances the disease may simulate lateral sclerosis, Friedreich's ataxia, or multiple sclerosis.

Treatment.—As in most organic nervous diseases, little can be done by therapeutic means. Massage and avoidance of contractures, with electricity in the form of faradism for the paralysis, comprise the chief remedies at our disposal. For epilepsy the same treatment as that employed in the idiopathic form is indicated. In the acute stage of the disease the measures recommended in the section on acute anterior poliomyelitis should be tried. Surgical treatment, especially suitable tenotomy, and, in special instances, trephining, will occasionally be of great service.

Family and hereditary forms of cerebral paralysis have been described. For information respecting them, the reader is referred to special works on the subject.

HEREDITARY (SPINAL) SPASTIC PARALYSIS. FAMILY AFFECTIONS OF THE CORD.

In describing the cerebral palsies of children, it was indicated that certain groups of these appear under the guise of cases of spastic paraplegia, and in order that the significance of this "symptom-complex" may be better understood, it is necessary to discuss it here somewhat more fully. Although, from their rarity, the conditions which we are about to describe cannot be regarded as of very great practical importance, their bearing upon diplegias of assuredly cerebral origin invests them with a considerable degree of interest.

Pathologists have not, as yet, determined whether a primary sclerosis of the lateral tracts does or does not occur; and though the present trend of opinion is, perhaps, on the whole against its existence, the possibility, at least, of such a lesion must be conceded. It has been suggested that, in some cases, a delay in the development of the pyramidal tracts may occur. It follows, therefore, that when a case presents symptoms compatible with a purely spinal lesion, we are not justified in asserting that the sclerosis is necessarily a secondary one; on the other hand, in the absence of microscopical examination of the nervous system by a competent observer, we cannot say definitely that the case has been one of primary lateral sclerosis. In speaking of diplegias we have incidentally mentioned the difficulty which may arise in determining whether a case is of cerebral or spinal origin; there the subject was discussed from the point of view of the former cause; here we consider spastic paralysis from the standpoint of its symptomatology.

Spastic paralysis, then, sometimes occurs as a family disease, with or without its actual development in previous generations. The cause of its appearance in several children of the same mother may obviously be some influence to which all were exposed at birth—a narrowing of the pelvis, delivery by forceps, or the like. It is therefore necessary to exclude such circumstances, and to assure oneself that the confinements were normal, before assuming that, because of its appearance in several brothers, the disease is truly of family origin. Should direct heredity be discovered, it is of greater positive evidential value in this respect.

The **symptoms** noticed in these cases are briefly as follows:—Stiffness in the legs, and delay in learning to walk; as the spasm advances, the gait becomes spastic, and progression may even be cross-legged, from the great adductor spasm. The reflexes are increased and clonus may be present, but at times, on account of the extreme rigidity, it cannot be elicited. With the spastic condition there is a corresponding, though usually slight paresis; the sensory functions, the state of the bladder and rectum, and the nutrition of the limbs, remain intact. Such a train of symptoms may appear soon after birth, or may not develop until a later period. Cases have been recorded where the disease began at the 7th, 9th, or 14th year. It has been observed that, when several members of a family have suffered from spastic paralysis, the remaining children (in whom there was no obvious spasm) showed increase of all the tendon reflexes. These cases, then, we may—without committing ourselves as to their morbid anatomy—regard as belonging to the **spinal type** of hereditary spastic paralysis. They are included along with spastic cerebral diplegia, under the term "Little's disease."

As an example of the **cerebro-spinal**, or more probably, **cerebral type** of hereditary spastic paralysis—a clinical entity distinct, we must repeat, from cerebral diplegia—we have a rare disease of infancy in which symmetrical changes at the macula lutea are an important symptom. It affects children in the earliest months of life, being usually noticed before the third month; Jewish families appear particularly predisposed to it, several brothers or sisters are affected, and the result is always a fatal one, the patients dying by the end of the second year. The chief symptoms of this condition—"**amaurotic family idiocy**" as it has been named—are its family occurrence, progressive defect of vision leading to absolute blindness, mental defect going on to complete idiocy, and more or less marked spastic paralysis of the extremities. In the first stage the infant displays muscular feebleness, and vision becomes imperfect; in the second stage the weakness is so great that sitting up is impossible, the head rolls helplessly, and, while taste and smell remain intact, only the perception of light is present; in the third stage the muscles waste, the child emaciates, and the reflexes are increased. The head is retracted and painful spasms of the muscles ensue. The temperature remains normal throughout. The fundal changes are characteristic; at the macula there is a greyish-white patch raised above the surface of the retina, and the fovea centralis appears as a cherry-red spot. These changes are seen as early as the fourth month of life; later, optic atrophy is developed. The anatomical changes seem to be of the nature of a degeneration of the pyramidal cells in the cortex, as well as of the corona radiata and whole course of the pyramidal tracts. Other parts of the brain are affected, but the temporo-sphenoidal lobe is to a great extent spared, a fact which may account for the persistence of the senses of taste and smell.

Before leaving the subject of hereditary cord affections we must remind the reader that Friedreich's ataxia and Marie's hereditary cerebellar ataxia are diseases of young persons; it is unnecessary to do more than mention them here. The subject of **multiple cerebro-spinal sclerosis** may be dismissed in a few words. Though rare in early childhood it is a disease of youth, and, when occurring in its typical form, is easy of diagnosis. In certain cases, however, its recognition may be almost impossible. When we remember that tremors, nystagmus, fits, spasm, and defects of speech are common both to it and to the diplegias, and when we consider how varied are the forms of the latter disease, we can easily understand how similar the manifestations of both may be. This is particularly the case should the symptoms present themselves in a comparatively young person, and also when multiple sclerosis occurs as a family affection.

An hereditary form of amyotrophic lateral sclerosis has also been described.

VASCULAR DISTURBANCES IN THE BRAIN.

The circulation of the brain depends, very much more than does that of any other viscus, on the state of the circulation in the rest of the body. It is, therefore, liable to experience great variations. As we have already shown while discussing the movements of the fontanelle, these variations can easily be observed in young infants. From their influence upon the venous blood-flow, respiration and posture play an extremely important part in the intra-cranial circulation. The fact must again be emphasised, that, provided there be a constant and fairly rapid flow of healthy blood through the capillaries, the exact intra-cranial pressure is a matter of comparatively little moment. If, however, this constant flow fail, first a condition of irritable weakness, then a total abrogation of function, will result. Such a disturbance of the blood current is caused by defective arterial pressure, or obstruction to the venous return; in the former, anæmia, in the latter, hyperæmia, is present. Anæmia and hyperæmia—each seems the antithesis of the other, yet, as regards their effect upon cerebral function, they are much more closely related than are venous hyperæmia and arterial hyperæmia, such as results from emotion and increased cardiac action generally.

For, in arterial hyperæmia, there is, at least at first, an increased flow of blood through the capillaries; in venous (obstructive) hyperæmia the capillary blood-flow will be decreased and the rising intra-cranial pressure may compress the capillaries and smaller arterioles—in other words, cerebral anæmia is produced. Such a sequence of events occurs in the case of tumours, tubercular meningitis, and other diseases associated with increased intra-cranial pressure. Bearing these facts in mind, and observing that *post-mortem* contraction or distension of the vessels is no conclusive proof of the existence of a similar state of matters during life, it will be seen that the consideration of intra-cranial vascular disturbances under the heads of cerebral anæmia and cerebral hyperæmia is at once difficult and unsatisfactory.

The presence of the yielding fontanelle allows the intra-cranial circulation in the infant to be carried on in circumstances otherwise impossible. With this *résumé* of the facts, we shall now briefly treat of general disturbances of the cerebral circulation, and of local disturbances usually the result of embolism and thrombosis.

CEREBRAL HYPERÆMIA.

This may be arterial or venous. **Arterial hyperæmia**, sufficient by itself alone to lead to symptoms, is extremely rare in childhood. It occurs after a trauma, in the early stage of inflammation, in acute fevers, and in some forms of sunstroke; in such cases the symptoms are probably to a large extent due to factors other than the hyperæmia. It may also occur under the influence of emotion, in conditions of unusual cardiac activity, and in stimulation of the vasomotor centre. The following symptoms (of whose relation to it, however, it is difficult to satisfy oneself) are usually said to characterise it:—Restlessness, insomnia, delirium, headache, flushing of the face; somnolence, and coma or convulsions, occurring later. The head feels hot, the pulse is quickened, and the temperature raised. Where no other lesion exists the symptoms are transient.

Venous hyperæmia occurs under a great variety of circumstances. General obstruction, such as heart failure and blocking of the pulmonary circulation, or local obstruction, as by tumours, enlarged glands, thrombosis of the veins of the neck, &c., may lead to it. The patient becomes dull, sleepy, and cyanosed; the pupils are sluggish; convulsions and coma may readily supervene. The fontanelle bulges, the respiratory waves become less marked, and the tracings of the individual pulse waves are smaller and more rounded.

Treatment.—If we suspect arterial hyperæmia the application of warmth to the extremities, and the use of purgatives, diuretics, and diaphoretics, are the remedies to which recourse should be had. Cold applied to the head, and cold douches, which, by stimulating the general vasomotor centre, increase the amount of blood sent to the brain, are worse than useless, since, as we have already seen, the intra-cranial blood supply is largely at the mercy of the general circulation. Sedatives, and in particular bromides, are indicated. In passive hyperæmia the cause should first be looked to and, if possible, removed. In addition, purgation, leeching, and local bleeding, may be employed; cardiac stimulants, hot bottles, &c., are also to be used.

CEREBRAL ANÆMIA

may occur in two entirely different conditions.

In the first there is general arterial anæmia; this is typically seen after profuse hæmorrhage or severe diarrhœa. If its onset be rapid, syncope results; if more gradual, the symptoms are—pallor, restless and disturbed sleep, feeble pulse, irregular breathing, dilated pupils, sunken fontanelle with small pulsations, and overlapping of the cranial bones. If to these be added convulsions and muscular twitchings and coma, we have the condition to which the term "hydrencephaloid" has been applied. It occurs typically in cholera infantum.

In the second variety of anæmia, seen in tubercular meningitis, some cases of tumour, &c., the capillaries are emptied and the brain substance blanched by the increased intra-cranial pressure. The symptoms are, at first, those of irritable weakness, then of abrogation of function.

Treatment.—Treatment of the cause, maintenance of the horizontal position, stimulation, the injection of fluid by the bowel or subcutaneously, and bandaging the limbs are the principal means at our command in dealing with cases of hydrencephaloid. In the second variety of cerebral anæmia, the removal of the cause, where possible, and the carrying out of the suggestions mentioned under venous hyperæmia, seem to be the limits of our resources.

CHRONIC HYDROCEPHALUS.

By the term hydrocephalus is meant an increase of the intra-cranial cerebro-spinal fluid; the increase may be in the ventricles, in the subarachnoid space, or in both of these situations. Hence we can distinguish anatomically between an internal and an external hydrocephalus.

External hydrocephalus is either acquired or congenital; it is usually secondary to wasting diseases, pachymeningitis, or atrophy of the convolutions; it has little clinical significance, and needs but to be mentioned.

Internal hydrocephalus is of much greater importance. Like the preceding it is either acquired or congenital; the former is said to be either acute or chronic, and liable to occur at any period of life. In the adult, however, where the walls of the cranium are rigid and unyielding, as also in acute cases generally, the symptoms must differ greatly from those with which we are familiar in the chronic hydrocephalus of childhood.

The **etiology and pathology** of internal hydrocephalus are obscure. Family predisposition, injury to the mother, alcoholism, and syphilis have been claimed as factors in the causation of congenital cases; in some instances they appear to be associated with fœtal rickets. Acquired hydrocephalus may be idiopathic, or, what amounts to much the same thing, may result from a latent congenital form. It may be secondary to another lesion, such as acute or chronic meningitis, or less frequently a tumour. Many hydrocephalic children are also rachitic, and a "dilatation hydrocephalus" has been said to result from repeated temporary rises in the intra-cranial pressure (as in the paroxysms of whooping-cough), acting on the rickety skull. Whether such a sequence of events does actually take place is open to question.

The most commonly accepted view of the pathology of hydrocephalus is that it is due to a chronic inflammation of the ependyma, causing increased transudation of fluid, and that there may be associated therewith an obliteration of the foramen of Magendie and aqueduct of Sylvius, with obstruction to the outflow of fluid. Other facts, however, go to prove that it may be a result of an arrested development of the cerebral vesicles.

As no practical advantage is gained by treating of the acquired type separately from the congenital form, and as the recognition of the disease depends on a comprehension of the general anatomical changes, it is convenient to speak of these before going on to the symptomatology.

Morbid Anatomy.—The changes in the skull are brought about by a rapid increase in the bulk of the intra-cranial contents. The bones are separated, and, as the sagittal suture is more affected than those running transversely, the head becomes more rounded than normal. With the gaping of the sutures ossification proceeds, although imperfectly; the bones increase in size and are altered in position. Owing to the wedging of the lower part of the frontal bone between the wings of the sphenoid, its halves are not separated—the frontal suture is not much widened at its lower part, but the bone as a whole is pressed forwards and upwards. The parietals are greatly bulged and, in consequence, the bi-parietal diameter is increased. The occiput is straightened, so that its apex ultimately forms the posterior pole of the skull; this increase in the hindmost part of the cranium is one of the reasons why the head tends so markedly to fall backwards. In addition to the lengthening of the two horizontal diameters, there is, largely owing to the growth of the parietal bones, an increase in the vertical measurement of the skull. So far the vault; the pressure, however, also affects the structures of the base. The orbits are greatly modified; the roof is pushed downwards and forwards, the supra-orbital arch is dragged up, and its inner half may be obliterated by being merged with the inner (membranous) part of the orbital plate. Resulting from these changes, and from the dragging up of the skin of the forehead, the characteristic position of the eyes is produced. The wings of the sphenoid and the squamous portions of the temporal bone are depressed, the zygomatic arches look downwards, and the external auditory meatus may be lowered until it is upon a level with the inferior maxilla. The face is less affected ; the only alteration consists in a widening of its upper part from broadening of the ethmoid, so that, since the jaws remain small, the typical triangular shape results.

Should the progress of the disease admit of complete ossification, the process spreads from centres in the membrane of the sutures ; from these, Wormian bones develop. The cranial bones are always abnormally thin and have no diploë ; the skull may actually be translucent.

The fluid collects in and dilates the ventricles ; it may be limited to the lateral and third ventricles ; at times it distends the aqueduct of Sylvius and fourth ventricle. The brain substance is thinned and may form a mere sac containing fluid ; the white matter, however, suffers much less than does the grey. The sulci and gyri are flattened, the ependyma is normal or thickened, the choroid plexuses and pia of the base may show signs of inflammation, the foramen of Magendie may be obliterated. The quantity of fluid varies, many pints may be present ; its specific gravity lies between 1001 and 1009, and it contains traces of albumin and sugar.

Signs and Symptoms.—Of these the characteristic appearance is the chief. The head is large and globular, the fontanelles and sutures wide, the skin tense, the veins prominent, the hair thin. The head rolls helplessly from side to side, or, in older children, is steadied by the hand. The weekly increase in circumference may be as much as one-third or one-half inch.

In contrast to the enormous vault, the face is pinched and narrow below ; the body is small and emaciated. The position of the eyes is extremely characteristic ; they are directed downwards, the sclerotic is visible above the iris, and the lower lid covers the lower half of the globe, reaching, in some instances, as high as the pupil. At other times there is slight ocular divergence. The cerebral functions are usually interfered with. The mental condition varies from a trifling degree of impairment to complete idiocy ; in most cases, possibly on account of the relatively slight interference with the grey matter of the cortex, it is less affected than might be anticipated. Motor paralysis, with or without spasm, is frequently present ; incontinence of urine and fæces is possibly to a large extent due to psychical causes. Even in the absence of paralysis the art of walking is late in being acquired. The only cranial nerves likely to be involved are those of the eye. Strabismus, usually external, nystagmus, choked disc, and optic atrophy are far from rare. Epileptic fits are not uncommon. In congenital cases the children are small, puny, and ill-developed ; and such anomalies as spina bifida, hare-lip, &c., are sometimes found. Rickets is common in acquired cases.

Course.—In most congenital cases the duration of life is short, but in some the patients reach adolescence. Usually, both in this and in the acquired form, the disease progresses, with occasional remissions, to its fatal termination. Should recovery take place the skull eventually becomes completely ossified. Spontaneous cure by the escape of fluid through the foramina of the base, or through a fontanelle, may in rare cases occur. The **prognosis,** therefore, both as regards life and with reference to the mental capacity, is bad ; it depends on the rapidity with which the size of the head increases.

The **diagnosis** is easy ; the only condition likely to give rise to error is a marked degree of rickets. The globular shape of the head, the psychical and motor symptoms, and, in particular, the position of the eyes, enable a correct opinion to be formed.

Treatment.—Besides general hygienic remedies, and the treatment of rickets if present, various curative measures have been adopted. Pressure by means of adhesive plaster or by elastic bandages has not proved of great value ; of puncture of a ventricle through the fontanelle, with or without subsequent injection of iodine, the same may be said. More recently, lumbar puncture has been recommended, but since (as Stiles has shown) drainage of the fourth ventricle is a perfectly feasible operation, this seems a measure promising better results. Of direct influence on the intra-cranial changes by the action of drugs there would seem to be little prospect.

MENINGOCELE AND ENCEPHALOCELE.

Some of the congenital defects of the brain have been incidentally alluded to under the morbid anatomy of cerebral paralysis, others may exist without giving rise to any symptoms, and others, again, may be of such a nature as to be incompatible with life. Of these it is unnecessary to speak. We must, however, refer to the occurrence of meningocele and its allies.

There is no distinct evidence that meningocele and encephalocele are due to disease ; they are rather the result of an arrested development and failure of union of the cranial bones, the error being apparently identical with that from which spina bifida results. According to the contents of the tumour we distinguish three forms: meningocele, when the protruding membranes contain only cerebrospinal fluid ; encephalocele, when they contain brain substance as well ; hydrencephalocele, when the brain substance itself is cystic.

The tumour is almost invariably characterised by a mesial position, and is usually situated over the occiput or forehead ; if lateral, it is commonly found in the orbital or parietal region. It is a tense, elastic, cystic swelling, the skin of which is not infrequently nævoid, and some sign of connection with the cranial cavity is generally present. It may pulsate, and give an impulse on crying or coughing; it may be partially or completely reducible, the reduction being probably accompanied by nervous symptoms.

The **diagnosis** of meningocele from other tumours is rarely difficult; it is not, however, always easy to form an opinion as to the exact nature of the cyst contents. Complete reducibility is evidence of meningocele, and here, too, the tumour is translucent. Arterial pulsation points to encephalocele; if the growth be very large it is probably a hydrencephalocele.

The **prognosis** is bad, but some patients have been known to live for many years.

The **treatment**, if any appear advisable, is surgical.

SPINA BIFIDA.

As in the case of malformations of the brain, congenital abnormalities of the cord may, on the one hand, be associated with monstrosity, or, on the other, give rise to no symptoms. Apart from these, the most important mal-development is the well-known, though not extremely common, spina bifida. This results from defective closure of the vertebral canal, leading to the protrusion of the meninges under the skin. The sac-like swelling may be composed entirely of membranes distended with cerebro-spinal fluid—a meningocele; it may contain part of the cord—a myelocele; or the cord itself may be cystic—a myelocystocele.

The seat of a spina bifida is usually in the lumbar or sacral region and in the middle line; the tumour is tense and elastic; the defect in the vertebral column can be felt; pressure on the sac may give rise to cerebral symptoms. When the lesion of the vertebræ is present without a hernial protrusion, we have the **spina bifida occulta**, and here, oftener than in other forms, the overlying skin is covered with hair.

Even although the cord remain unaltered in position, its functions are usually more or less impaired. Patients with spina bifida not infrequently show other developmental errors, and, in a large proportion of cases, deformities directly due to the cord lesion are present. Club-foot is very common, resulting, no doubt, from paralysis of certain groups of muscles. The loss of power may be more extensive, and complete paraplegia with absence of knee-jerks, interference with the functions of the bladder and rectum, sensory and trophic disturbances, and, in particular, perforating ulcer may occur.

The **prognosis** is not a good one; the **treatment** is mainly surgical.

TUMOURS OF THE BRAIN.

Cerebral tumour is not a frequent disease in childhood, and were it not for the occurrence of cerebral tuberculosis it would hardly be necessary to mention it here.

Tubercular nodules form at least the half of all tumours found; glioma and sarcoma are much more rare; gummata are practically unknown. In about 40 per cent. of the cases the cerebellum is the seat of the lesion. The general and focal symptoms of sarcoma, glioma, and the like, are, on the whole, the same in the child as in the adult. In very young children they are influenced by the yielding nature of the cranial box, on account of which a tumour may lead to general or local bulging; and the diagnosis is hampered by the necessity of relying exclusively on objective phenomena.

Percussion of the skull has been called in to aid the diagnosis. The note thereby elicited depends on the fact that the cranial walls vibrate when struck, and is modified by the consistence and volume of the contents of the skull, as well as by their position relatively to the bones. Direct percussion with the finger over a point at, or behind, the pterion, the child being held in an erect attitude the while, is the method recommended. In infants, whose cranial bones are freely movable, the note is flat and scarcely perceptible; as the tension increases—and especially if, at the same time, the fontanelles remain patent—the note becomes clear and drum-like. In distension of the lateral ventricles, and in rachitic enlargement, the resonance is also increased (*Macewen*). As regards new growths in the brain, the chief diagnostic value of percussion would, therefore, appear to lie in the fact that a hyper-resonant note obtained in a case where tumour symptoms were present, would indicate the involvement of the cerebellar fossa.

Tubercular nodules (which are seldom primary) are in some respects peculiar. They are often multiple, from two up to twelve or more, but one only may be present—the solitary tubercle. Their size varies from that of a pea to that of a walnut or larger; on section, the contents are seen to be caseous, or breaking down to a whey-like fluid. The nodules are usually situated in the grey matter of the cortex, cerebellum, basal ganglia, or pons; they are rarely found on the surface of the base of the brain. It is characteristic of them, that for long periods they may remain latent, and that when they do manifest themselves, the symptoms, so far as the localising of the tumour goes, are often misleading. This ambiguity is due in part to the complication of meningitis arising, and in part to the fact that of several tumours, some, and these by no means the smallest, may remain latent, while others give rise to symptoms.

The recognition of cerebral tuberculosis depends on the existence of chronic brain symptoms. occurring in children either of tubercular heredity, or bearing signs of tuberculosis elsewhere, or showing what is called, for want of a better term, the "scrofulous diathesis." Recurrent general or partial convulsions, with cerebral symptoms such as headache, vomiting, squinting, paralyses of various regions, and optic neuritis or atrophy, occurring in such patients, warrant the diagnosis.

It will have been gathered that to localise the lesion is by no means an easy task. It is based upon the same inferences as in the adult, and here it is only necessary to point out the greater difficulty in recognising and interpreting nervous symptoms in the child, and to repeat that the tumour is often multiple and not infrequently complicated with meningitis.

The **treatment** is on ordinary lines. Surgery appears to hold out small promise of success; the tumour is usually tubercular, and children bear operations on the brain somewhat badly.

APHASIA AND OTHER SPEECH DEFECTS IN CHILDREN.

In dealing with the physiology of the child we have already discussed the age at which speech is usually acquired. Many children, although quite healthy in every other respect, do not speak until a comparatively late period. The cause of this delay it is not always easy to discover, but no doubt it depends, in many instances, on slight dulness of the intelligence. In other cases, the quietness of the child's surroundings, or an hereditary tendency to the slow development of language, may explain it. Parents often become anxious if their child does not begin to speak by the time it is about fifteen months old; should the hearing appear good, and no sign of mental deficiency be observed, they may be re-assured upon this point. In the event of absence or defect of speech at a later date, the physician must determine whether it is due to purely mental causes, to a localised lesion of the brain and true aphasia, or to a peripheral lesion affecting the course of the receptive or productive routes for speech. In all cases, then, the general mental condition should be noted: Does the patient look bright and intelligent? Does he understand signs? Can he appreciate facial expression? Is he cleanly in his habits? In grave forms of idiocy speech may be entirely absent, or echolalia—the power of repeating a few sounds heard—may alone be present. In slighter forms of imbecility the speech is usually more or less defective. Next, the peripheral apparatus, both receptive and productive, falls to be investigated. On the word-hearing side, the condition of the ears must be enquired into; on the voice-producing side, the oral-articulative mechanism should be examined, and deformities of the palate, adenoids, and extreme shortness of the frenum sought for. Deafness, if congenital or occurring in early infancy, usually leads to dumbness; the resulting condition is known as "deaf-mutism." Even when the child has reached the age of five or six, and has learned to speak fairly well, deafness is apt to lead to mutism; and, in order to produce this unfortunate result, the deafness need not be absolute. When both mental deficiency and affections of the peripheral speech-apparatus can be excluded, defective production of language must be ascribed to some lesion of those parts of the brain which subserve the function of speech. It would appear that actual congenital aphasia may occur, presumably from disease or mal-development of the centres whose future it is to preside over the production of spoken language.

The word-hearing centre is of course that which is first developed, the word-speaking centre is the next. The word-seeing and word-writing centres are much later in their (physiological) development, and not until after the age at which reading and writing are acquired can symptoms pointing to affection of them occur.

In older children the phenomena comprised under the term "aphasia" are the same as in adult life; in young children two important facts are worthy of mention. The first point is that affections of speech occur with lesions of the right as well as of the left hemisphere; the second, that aphasia is comparatively readily recovered from. These peculiarities are to be explained upon the ground that the left half of the cerebrum has not acquired predominance over the right; that is, that both are being employed in the acquirement of speech. Consequently, should one centre or set of centres be incapacitated, it is easy for the opposite set to take on their functions. It should, in addition, be mentioned that temporary (functional or toxic?) aphasia is by no means unknown; it occurs during the convalescence from such diseases as typhoid fever, and also in nephritis. The ordinary causes of aphasia—hæmorrhage, embolism, and thrombosis—are rare at the period of life with which we are dealing, hence the disease itself is uncommon; cases following embolism are occasionally seen. Motor aphasia is the most usual variety, and may be due to this cause, to tubercular meningitis, or to tumour. Word-deafness is in most instances a symptom of abscess of the temporo-sphenoidal lobe following middle-ear disease. A meningitis of the base of the brain may lead to dysarthria, and, at times, cases of hysterical aphonia or mutism are met with. In addition to the above, various forms of speech-defect, such as stammering and stuttering, lalling, and the like, are common, but scarcely fall within the province of this book. Explosive outbursts of speech, or of obscene language (coprolalia) occur in several nervous diseases.

ACUTE ANTERIOR POLIOMYELITIS: INFANTILE PARALYSIS.

The disease affects children between the ages of six months and four years; by far the greater number of cases, however, occur before the beginning of the third year.

The onset is sudden: in the midst of perfect health the child becomes feverish, the temperature rising to 102° to 104° Fahr.; vomiting, general convulsions, and even coma may occur. So severe are these constitutional symptoms that the nature of the case is not at first evident; their duration, however, is but short, from a few hours to a day or two, and when they disappear the child is found to be more or less extensively paralysed. In other cases the initial fever and convulsions are absent; the child goes to bed in its usual health, but when it wakes in the morning there is complete loss of power in one or more limbs. By the time the paralysis is noticed it has usually reached its maximum; occasionally, however, it increases for a day or two. As time goes on, the paralysis, instead of remaining stationary, begins to diminish, till, in a few weeks, it is limited to a group of muscles, or even a single muscle—or, in severer cases, to a whole limb. This is the characteristic feature of the disease. In no other condition do we meet with a suddenly-developing, extensive, and complete paralysis, which so constantly tends to at least partial recovery.

By the time the child comes under observation, some weeks have usually elapsed since the onset of the disease, and the paralysis has become fairly limited in its area.

The leg is much more often affected than the arm, and both legs more often than an arm and a leg; when an upper and a lower limb are paralysed they are generally those on opposite sides of the body. In the majority of cases the paralysis is partial, that is, limited to one muscle or group of muscles. It has been pointed out that affected muscles are usually those standing in functional, not in anatomical, relation to one another; thus the extensors of the forearm may be involved while the supinator longus is spared; or the supinator longus, brachialis anticus, deltoid, and biceps are paralysed together. In the leg, paralysis occurs in the following order of frequency:—(1) Peroneal muscles. (2) Posterior tibial. (3) Anterior tibial and anterior thigh muscles. (4) Posterior thigh muscles. The sartorius very often escapes. The paralysis is, from the first, a flaccid one; the muscles waste rapidly, some diminution in size being often discernible by the end of the first week. With the atrophy the electrical reactions become impaired, and, when the lesion is severe, the muscle ultimately yields the complete reaction of degeneration.

The trophic changes are not confined to the muscles; the skin is blue and cold, the subcutaneous tissue may waste, the growth of the bones be retarded, or the bones themselves become thin and atrophic. The affection of the structures just named does not always, however, bear a direct ratio to the paralysis; sometimes it is but trifling, at other times it predominates.

These are the chief changes in the nervous system. The sensory functions, the functions of the bladder and rectum, remain intact; the cranial nerves, save in almost unique cases, are spared; the tendon reflexes are only abolished when the paralysis affects the special muscles involved in their production. The general health remains good.

As time goes on a new series of phenomena develops. The sound muscles, being no longer opposed, overcome the paralysed ones and so lead to the production of deformities. The most common of these are pes equinus, equino-varus, and valgus, genu recurvatum and incurvatum, extension of the wrist, flexion of the wrist and claw-hand, subluxation of the shoulder joint, scoliosis, kyphosis, or lordosis. The hip and elbow are rarely involved. These deformities can at first be rectified by simple manipulation; but eventually fibrous changes take place whereby they are rendered permanent.

The **etiology and pathology** of the disease are obscure. Its age-limits have been referred to; cold and trauma are the causes to which it is most frequently attributed, but it may succeed some acute disease. From the nature of the invasion and from the fact that epidemics have been described, it is now regarded by most authorities as of an infective character.

Morbid Anatomy.—In the early stages the changes found have been of the nature of an acute inflammation of the grey matter of the anterior cornua of the cord; the vessels are engorged and prominent, there is a round-cell-infiltration of the neuroglia, the ganglion cells in places show signs of degeneration. In later stages the change is strictly limited to one or more segments of the cord, the grey matter is shrunken, the nerve cells atrophic; at times a descending degeneration may, in addition, be present. As in some cases there is, at the onset, a certain amount of pain along the course of the peripheral nerves, it has been suggested that the inflammation may not, at first, be invariably limited to the anterior cornua, but that a temporary neuritis may also occur. This, however, remains doubtful.

Course and Prognosis.—In this disease there are four stages (*Gowers*):—1. Initial stage of paralysis, progressing rapidly, often with fever; duration from about an hour to a week or more. 2. Stationary period, lasting from a week to a month. 3. A stage of retrogression in which the palsy tends to pass away; lasting from one to six months. 4. Chronic permanent stage; improvement, if any, but slight.

While, after a week or so, the paralysis shows signs of diminution, the ultimate result of the disease is uncertain and cannot be prophesied before three or four weeks at least have elapsed. The electrical reactions afford the best means of foretelling in how far recovery will ensue. Muscles which still react to the faradic current one week after the paralysis has declared itself—and still more those which so react two or three weeks later—will almost certainly recover. When complete reaction of degeneration has developed within ten days, entire recovery of function is scarcely possible, and, in all probability, the muscle will be permanently paralysed. The later a muscle shows the reaction of degeneration the greater prospect is there of at least partial recovery.

The prognosis as regards life is favourable, the disease being very seldom fatal. Relapses are rare.

Diagnosis.—This is, in most cases, easy. In the absence of a history it may be impossible to distinguish between infantile paralysis and a birth palsy affecting the arm. A little care should prevent its being mistaken for a pseudo-paralysis, such as is met with in syphilis, osteomyelitis, &c.

One condition with which it is sometimes confused is extreme muscular atrophy following rickets. Should real difficulty arise, the electrical reaction is decisive. Multiple neuritis is rare in children, and differs from anterior poliomyelitis in its gradual onset, in its symmetry, in the presence of pain and other sensory disturbances, in the occurrence of œdema, and in the chronic course of the fever. When paralysis develops suddenly after a trauma, it may be difficult to say whether the cause is spinal hæmorrhage or poliomyelitis; possibly the latter may result from the former.

Treatment.—During the acute stage absolute rest should be enjoined, diaphoretics and gentle purgatives may be given, and, in some cases, counter-irritation or local bleeding may prove of value. After some weeks, provided that all signs of constitutional disturbance have completely disappeared, electricity should be cautiously applied, and its use should be persevered in for months. The faradic current is used for those muscles in which it induces contraction; where it fails the galvanic current is to be used. In no case should the current be stronger than what is required to cause contraction. Massage is of great value as an adjunct to the treatment; suitable gymnastics and the use of warm baths and douches are also to be recommended. Strychnine may be given either by the mouth or hypodermically; care must be exercised not to begin it before the spinal cord mischief has become absolutely quiescent.

The deformities resulting from the disease must be dealt with surgically.

PROGRESSIVE MUSCULAR DYSTROPHIES.

We may remind the reader that, putting aside cases of atrophy due to acute affections of the brain, cord, or peripheral nerves, diseases characterised by progressive wasting of the muscles are divided —according as the lesion is in the spinal cord, peripheral nerves, or the muscles themselves—into progressive spinal muscular atrophies, progressive neural muscular atrophies, and progressive muscular dystrophies (myopathies).

Though the first of these is not absolutely unknown in childhood, and though the peroneal-forearm (*Charcot-Marie*) type of atrophy, which probably belongs to the second group, is a disease usually commencing in youth or at puberty, the dystrophies alone claim our attention here.

The clinical types of primary muscular dystrophy are three in number:—**pseudo-hypertrophic paralysis**; **juvenile progressive muscular atrophy**; and **infantile atrophic muscular dystrophy**, with, or more rarely without, affection of the face.

These dystrophies agree in many points. (1) They are all hereditary, or, at least, occur in more than one child of a family, sometimes in the same, at other times in different form. (2) They are essentially diseases of youth, occurring in infancy, in childhood, or at puberty. (3) They tend to spare certain muscles—the extensors of the toes and fingers, the small muscles of the hand and foot, those of the tongue, and those concerned in the act of deglutition, The muscles most frequently involved are the trapezius, serratus magnus, pectoralis major, latissimus dorsi, rhomboidei, infraspinatus, biceps, brachialis anticus, supinator longus, and, to a less extent, the deltoid; the erectores spinæ, glutei, quadriceps femoris, adductors of the thigh, gastrocnemei, and peronei; the facial muscles, and especially the orbicularis oris and orbicularis palpebrarum. (4) The anatomical changes are essentially the same in all—an atrophy or slight hypertrophy of the muscular fibrils, with preservation of the transverse striæ; an increase in the interstitial connective tissue, and at times fatty degeneration, giving, it may be, the appearance of hypertrophy. (5) Resulting from these anatomical changes we have the following important common diagnostic features:—Quantitative alterations in electrical excitability, but no reaction of degeneration; and absence of fibrillary twitchings, such as are seen in progressive muscular atrophy of spinal origin. Furthermore, disturbance of sensation is never present.

PSEUDO-HYPERTROPHIC PARALYSIS.

This is most common in boys, and is usually first observed between the fifth and tenth year. It is markedly hereditary, the descent being through the mother.

Beginning in the calf muscles, the weakness spreads to the thighs and buttocks, the gait soon becomes waddling, and the child shows signs of difficulty in climbing up stairs or rising from the ground. When well developed the disease is easily recognised; the calves, thighs, and buttocks are hard, firm, and voluminous, and give an appearance of muscular power in striking contrast to the real state of matters. The weakness extends to the muscles of the back, lordosis results, and this, with the waddling gait, the pseudo-hypertrophy, and the method of rising from the ground, is quite characteristic. The last mentioned is a pathognomonic symptom:—From the recumbent position the child gets on all-fours, elevates the body with the arms, places one hand and then another on the thighs just above the knee, and by straightening himself thus, succeeds in making his arms do the work which the erectors of the spine are too weak to accomplish.

In many cases some of the muscles affected are atrophied from the first; in all, the pseudo-hypertrophy ultimately gives place to atrophy. The skin of the legs may be mottled and the limbs cold. The bladder and rectum are unaffected, the sensory functions normal. Occasionally, however, some degree of mental impairment is present.

The affection may spread to the muscles of the shoulder, and occasionally to those of the face. In these situations atrophy, not pseudo-hypertrophy, is the rule.

JUVENILE PROGRESSIVE MUSCULAR ATROPHY (*Erb*).

This type affects girls more than boys, and usually develops about the time of puberty. The shoulder-girdle, back, and legs are involved; the muscles affected being the pectoralis major and minor, the trapezius, latissimus dorsi, serratus magnus, rhomboidei, biceps, brachialis anticus, supinator longus, erectores spinæ, glutei, quadriceps extensor, and peronei.

INFANTILE ATROPHIC MUSCULAR DYSTROPHY, FACIO-SCAPULO-HUMERAL TYPE (*Landouzy-Déjerine*).

The wasting is most markedly and characteristically present in the muscles supplied by the facial nerve; the eyes remain half-open, the cheeks fall in, the mouth gapes slightly, and the lower lip hangs, (at times the orbicularis oris appears as if hypertrophied); the movements of crying, laughing, &c., are impaired or impossible. The wasting often extends to the shoulder-girdle and legs.

Diagnosis of Muscular Dystrophies.—The detection of a primary dystrophy depends on the recognition of the peculiar features mentioned above. Of special importance are the absence of fibrillary twitchings and of the reaction of degeneration. The diagnosis of the type to which any case belongs depends on the distribution of the atrophy. We must, however, bear in mind that, as the relations of these are not completely understood, each case should be examined on its own merits, and should not be arbitrarily thrust into the group which it appears most to resemble. Many cases are intermediate in type, and may at first seem to belong to one group, but later show more resemblance to another.

The only condition likely to be mistaken for a dystrophy is that of congenital absence or atrophy of certain muscles. It is of interest to note that the muscles most frequently involved in this way are precisely those liable to be affected by dystrophy—the serratus, rhomboids, trapezius, and pectoralis major.

BIRTH PARALYSES OF PERIPHERAL ORIGIN.

In a previous chapter we have alluded to birth paralyses produced by cerebral lesion; it remains for us here to notice those due to affection of the peripheral nerves.

BRACHIAL PLEXUS PARALYSIS.

This may be brought about by certain measures used in extracting the fœtus. The most important of these are traction by a finger or hook placed in the axilla, the pulling down of an arm which has slipped up, the pressure of forceps on the supra-clavicular fossa, and traction on an after-coming head. The lesion may affect both sides, but is more frequently unilateral. In severe cases it is of the nature of a hæmorrhage round about the nerves, or a tearing of their fibrils; in slight cases there may only be some stretching of the nerve trunks, or possibly some injury of their sheaths. The whole plexus may be involved, but more commonly (in the ordinary Erb's paralysis) the lesion is limited to the fifth and sixth cervical roots.

The first appearance of paralysis is usually noted some days or weeks after birth; the arm hangs limp and motionless, and—though this is often difficult to ascertain—it is probable that, in most cases, the sensations of pain and touch are impaired. As time goes on the muscles atrophy, and more or less complete reaction of degeneration can be made out; the limb is cold, its growth is retarded, and contractures develop. The distribution of the paralysis in the typical Erb's palsy will be best understood by a reference to the anatomy of the nerves concerned. The fifth and sixth cervical roots unite to form the first trunk of the brachial plexus, which, like the other trunks, divides into an anterior and a posterior portion. The former unites with the anterior division of the second trunk to form the outer cord, the latter with the posterior divisions of the second and third trunks to form the posterior cord. Owing to this crossing of nerves, some fibres, both of the outer and of the posterior cord, will be affected by a lesion of the fifth and sixth roots, while other fibres will escape. The affected fibres are those of the circumflex nerve to the deltoid, of the musculo-spiral to the brachialis anticus, biceps, and supinator longus; and, at times, those of the supra-scapular nerve to the infra-spinatus, and of the sub-scapular to the subscapularis. It results from the paralysis of these muscles, that the arm is held by the side and cannot be raised, the humerus is rotated inwards, while the forearm is extended and pronated; sensation is, to a great extent, intact. It will, of course, be understood that only after the paralysis has existed for a considerable period is the investigation of its exact distribution practicable. It may be difficult or impossible to make out the precise nature of the lesion in a very young infant; the above description, therefore, applies chiefly to patients who have passed infancy; in whom the individual muscles can be tested; and in whom sensory disturbances have, to a great extent, disappeared.

In total brachial-plexus paralysis the loss of power is more complete; but, even here, sensation is not entirely abolished. It usually remains unimpaired over those parts of the arm not supplied by the median nerve.

The **prognosis** is, on the whole, favourable, recovery being the rule in all save the most severe cases. If reaction to the faradic current be not entirely lost, improvement may be expected within two or three months; if it be gone, but the galvanic current produce normal contraction, the disease may be recovered from in about six months. Where the reaction of degeneration is obtained, the paralysis will probably remain for a year or may be permanent.

Diagnosis.—In most cases it will be impossible, for some time after birth, to make out the exact nature and extent of the paralysis. To distinguish it from cerebral paralysis is a matter of little difficulty; in the latter, monoplegia is rare, spastic rigidity is marked, the deep reflexes are exaggerated, there is no reaction of degeneration. When seen at a late period brachial-plexus paralysis may closely resemble an acute anterior poliomyelitis. The history of the case and the distribution of the paralysis are the best aids at our command. The history, again, is sufficient to distinguish a birth paralysis from a brachial-plexus paralysis due to trauma at a later period. Last, a syphilitic epiphysitis with pseudo-paralysis may be mistaken for palsy; here a careful examination will show that the muscles are spared and the bone alone involved.

FACIAL PARALYSIS.

This we may dismiss with a few words. An obstetric facial paralysis is not uncommon. It may be due to pressure of the forceps, and is either of merely transient nature or more severe and persistent. As soon as the child is born it is noticed that, when it cries, one side of the face remains immobile and one eye wide open. The paralysis may pass off in a few minutes or hours, or may last longer. Recovery generally ensues within two or three weeks; it may be delayed or the condition may prove permanent.

In older children, facial paralysis is due to cold ("rheumatic" palsy), to middle-ear disease, or to cerebral lesions. It may, although very rarely, accompany infantile spinal paralysis, and is, at times, the first sign of the onset of tubercular meningitis.

OTHER PERIPHERAL PARALYSES.

Birth paralysis of the lumbar plexus and lower limbs is rare. In older children a peroneal paralysis, resulting from trauma, is not uncommon. Paralysis of the spinal accessory nerve, with its result, wry-neck, is sometimes obstetrical.

Treatment of Peripheral Birth Paralyses.—Beyond protecting the part from injury, no treatment should be employed until two or three weeks have passed. Then electricity should be used. Faradism, or—if the muscles do not respond—galvanism, is employed; the current must be no stronger than is required to induce contraction, the sittings should last for from fifteen to twenty minutes daily. Much depends upon massage and the prevention of contractures. At a later period splints may be needed; and, in suitable cases, much benefit follows tenotomy.

CHAPTER XIX.

ACUTE INFECTIOUS DISEASES.

Contents.—Diphtheria—Typhoid or Enteric Fever—Scarlet Fever—Measles—German Measles—Chicken-pox—Whooping-cough—Mumps—Epidemic Cerebro-spinal Meningitis—Glandular Fever.

DIPHTHERIA.

DIPHTHERIA is always due to infection, though the source of contagion cannot always be traced. In many instances it appears to be conveyed directly by the breath of a person already suffering from the disease; at other times the spread may be by fomites, or, occasionally, by contaminated milk. The organism resists drying and changes of temperature; the infection is, therefore, of a persistent nature. The possibility, at least, of contagion from certain animals must be admitted. The condition of the mucous membrane of the pharynx at the time of exposure to infection is of great importance in the etiology of the disease. Thus, diphtheria may be engrafted upon a chronic tonsillitis or an acute sore throat, especially one due to bad drainage, and we have seen it follow the removal of adenoids and tonsils.

The disease is one specially liable to affect children, and is most common between the twelfth month and the sixth year; while sporadic cases are rarely absent, it at times assumes an epidemic character. The incubation period is a short one, seldom exceeding two to five or seven days.

Symptoms.—The attack is ushered in by headache, feverishness, sore-throat, difficulty in swallowing, and a sense of general illness; but as young children rarely complain of definite symptoms, the disease may escape observation unless an examination of the throat be made. On inspecting the pharynx a greyish-white membrane is seen, extending over the surface of one or both tonsils, and, in many cases, involving the soft palate and uvula. The exudation is raised from the surface of the mucous membrane and looks as though it could easily be detached. Further examination, however, shows it to be somewhat firmly adherent, and, when raised, it leaves a raw bleeding surface. In addition to the presence of the patch, there is general redness and swelling of the buccal mucous membrane, and, very frequently, enlargement and tenderness of the glands of the neck. In most cases the constitutional symptoms are marked; the temperature is raised to 100°-102° Fahr., in some instances the fever is less, in others it may run higher, but its course is irregular and no special type can be regarded as characteristic of the disease. The pulse (in an average case) is quickened in proportion to the rise of temperature; in abnormal cases it may be extremely rapid or unusually slow. The general appearance of the child varies according to the severity of the infection; at times there may be little uneasiness, more often, however, the patient appears ill and prostrated. Anorexia is a very frequent symptom, and the urine usually contains a considerable trace of albumin. The course and severity of an attack of diphtheria depend on the local lesion, the systemic poisoning, or on both of these combined.

Local Changes.—The false membrane varies from the merest patch on the tonsils, hardly more than is seen in follicular tonsillitis, to a lesion which proves rapidly fatal either from its situation or extent. As regards the site of the membrane, the tonsil is probably the most common starting-point, but often by the time the case comes under observation the soft palate and uvula are also invaded; the pharyngeal wall and hard palate are affected only in the more severe cases, while true diphtheritic membrane has seldom been described on the cheeks or on the lips, and then, probably, only when excoriations admitting the ready entrance of the organism were previously present. From the original site on the tonsils and palate the membrane may spread either in an upward or downward direction, and should it do so the gravity of the illness is markedly increased. Diphtheritic rhinitis shows itself by the presence of coryza with an ichorous bloody discharge from the nostrils, irritating and excoriating the skin of the lips. Rhinoscopy can seldom be practised, but sometimes membrane may be seen appearing through the nostrils, or pieces of it may be expelled by sneezing or expiratory efforts. The membrane occludes the nasal passages and, when got rid of, bleeding occurs and crusts form, which, together with the re-developing false membrane, are extremely distressing to the child. It would appear that the disease rarely begins in the nose, but rather spreads there secondarily to a pharyngeal diphtheria. It must, however, be confessed that the diagnosis of primary diphtheritic rhinitis proves extremely difficult.

Even more to be dreaded is the downward spread of the exudation; and while rhinitis is usually only met with in the severer types of infection, membranous laryngitis is a too common complication of milder forms. The voice and cry are noticed to be hoarse, and though this may be merely the result of simple laryngeal catarrh, it always awakens the suspicion of more serious mischief. Soon the breathing becomes stridulous, the voice is hoarse and whispering, and the cough croupy. The respirations are laboured but not much hurried; they become more and more audible, and are attended by inspiratory retraction of the less supported parts of the chest wall—the lower interspaces and the supraclavicular fossæ, and at the same time signs of deficient oxygenation of the blood develop. The false membrane often extends beyond the larynx—in severe cases even down to the ramification of the smaller bronchioles. During the progress of the disease along the respiratory passages, temporary relief is afforded by the expulsion by coughing of shreds of membrane or actual casts of the trachea and bronchi. The cyanosis disappears, and the distressed breathing becomes easier, but the improvement is only temporary; as the membrane re-forms, the patient relapses into his former state. Laryngeal diphtheria, again, is almost invariably secondary to pharyngeal affection—even in cases of so-called membranous croup, it is always possible that some patch of membrane may lie hidden from view behind a tonsil or low down in the pharynx. At the same time, the occasional occurrence of direct laryngeal infection cannot be denied, and, in some rare instances, an upward spread from the bronchi is said to have taken place.

Diphtheria is not, however, at all times a throat affection. The membrane may develop primarily on an excoriation of the skin, on the conjunctivæ, or on the female genitals; in such cases secondary infection of the pharynx may occur.

In addition to these differences in its extent and locality, the appearance of the membrane varies with the severity of the case. Benign types are associated with whitish-grey patches; in severer forms the patches are yellowish or darker in colour, often of a somewhat soapy appearance and discoloured by the presence of dried blood. The mucous membrane of the throat is congested and swollen, showing raw, bleeding areas from which the diphtheritic exudation has been detached; in severe cases these may progress to form deep ulcers and actually erode or destroy the soft palate. In cases where the membrane is wide-spread and dark in colour, where there is much inflammatory reaction in the throat, where there is sloughing and marked tendency to hæmorrhage, and where the glands of the neck are greatly inflamed or actually suppurating, we usually have to do with a mixed infection.

The **general symptoms and complications** of diphtheria are numerous, and their importance often difficult to estimate; they depend on the absorption into the system of the poison manufactured by the organism at the place of infection.

Some cases are so trivial as to be regarded as ordinary sore-throat. Between these and the acute, rapidly fatal forms all varieties occur. But in every case, however slight the local appearances, certain complications must be looked for.

In severe types there may be rapid and extreme collapse with a very quick or abnormally slow pulse, coldness of the extremities, and a high or subnormal temperature. Indeed, it cannot be too emphatically stated that the risk of **heart-failure** is one of the most serious and ever-present features of the disease. From the very first, we may have the patient so seriously affected that his pulse is running and speedily ceases. It is, however, of almost greater importance to be on the outlook for cardiac failure at a later period. After all the membrane has completely cleared away, or—if tracheotomy has been required—after the tube has been removed, we may suddenly find the patient with a rapid, thready pulse, which refuses to respond to cardiac stimulants, and is soon followed by fatal syncope. Even more startling are those cases where a child, apparently completely recovered and sitting up playing with toys, suddenly falls back dead from heart-failure. It can hardly be doubted that, in such cases, we have to do with a cardiac paralysis analogous to the other post-diphtheritic paralyses about to be described. As a rule the cardiac weakness is not signalised by any complaint on the part of the patient, but is only detected by the examination of the pulse. Not infrequently, however, it is accompanied by vomiting, and this symptom, especially when occurring during convalescence, ought always to direct attention to the state of the heart.

Albuminuria is a common complication, but one of no great prognostic value; it may simply be an evidence of the febrile or toxæmic condition; or, should formed elements be present in the urine, may be the result of acute nephritis. Hæmaturia is decidedly rare.

Eruptions.—In severe septic types of diphtheria various cutaneous rashes may occur; they are often erythematous and tend to become petechial. When they are found, the prognosis is a bad one; the patient has a leaden, dusky colour, and not infrequently suffers from hæmorrhages from other organs of the body.

Digestive disturbances are frequent and important, inasmuch as they interfere with one of the great indications for treatment—that of supporting the strength. Anorexia is an almost constant symptom, and vomiting may also occur.

Anæmia is rapidly produced, and with the diminution of the red corpuscles there is a well-marked leucocytosis.

Pulmonary complications.—More particularly if the air passages be involved by the membrane, the case may be complicated by bronchitis or pneumonia. The pneumonia is a lobular one, and is apparently not due to the Löffler bacillus, but to the presence of strepto- and staphylococci. Pneumonia, with heart-failure, is the chief cause of the high mortality among cases of tracheotomy for diphtheria.

Post-diphtheritic paralysis is a most important complication, or rather sequela, of diphtheria. It may occur after mild as well as severe attacks; indeed it is said to be more frequent after the former. Probably, however, this is partly to be explained by the fact that a large proportion of severe cases do not live long enough for paralysis to develop. A similar explanation holds good of the apparent increase since the introduction of the antitoxin treatment. Post-diphtheritic paralysis rarely affects children under one year. Though sometimes delayed till a month has elapsed, it usually occurs during the second or third week after recovery from the throat symptoms. It may affect various structures. Paralysis of the palate is the form most frequently met with. It sometimes appears very early—even while the throat is covered by membrane. The voice becomes nasal, food is regurgitated through the nose, the palate hangs motionless during deep inspiration, and even touching it with a probe does not elicit reflex contraction. Paralysis of accommodation is not uncommon. The patient is unable to read, and near objects appear blurred and indistinct. The paralysis of the ciliary muscle is sometimes, but not usually, combined with paralysis of the sphincter iridis (mydriasis). Hence the pupil, which responds to light, may also contract during convergence and efforts at accommodation. Ptosis and other ocular paralyses are decidedly rare. Slight paralysis of the legs, indicated by loss of the knee-jerks, is probably extremely frequent, though unless our attention is specially directed thereto it may escape observation. Bad cases exhibit great ataxy, or even double foot-drop with atrophy of the extensor muscles. Apart from subjective sensations in the limbs, there is seldom any sensory disturbance. Paralysis of the pharynx and larynx are uncommon. Cardiac paralysis is a frequent and dread complication. Post-diphtheritic paralysis is usually recovered from. It lasts from six to eight weeks, improvement being often first manifested in the eyes. The legs, if severely paralysed, seldom completely regain their power until four or six months have elapsed; and the abolition of the tendon reflexes lasts yet longer. Though its exact nature has not been definitely proved, post-diphtheritic paralysis is generally regarded as a peripheral neuritis.

Course.—The course of diphtheria is very variable; convalescence may be established in eight or ten days, or the disease may last much longer. It must be remembered that even after recovery, bacilli may remain in the throat for as long as several weeks. Isolation ought, therefore, to be maintained until the bacteriological examination is negative.

Pathology.—As previously stated, the term diphtheria ought to be restricted to conditions due to the Klebs-Löffler bacillus. In some cases, this organism alone is present in the membrane; in others, there is a mixed infection. In the majority of the latter, streptococci are associated with the Löffler bacillus, but occasionally pneumococci, or—giving a very malignant type—staphylococci, may be present. While the virulence of the organism varies very greatly in different cases, a severe form of the disease may follow infection from the mildest case. It must, however, be said that epidemics are at times mild, at times extremely fatal; in the latter case there is usually a mixed infection.

Diagnosis.—The diseases with which diphtheria is most likely to be confounded are follicular tonsillitis and the membranous forms of pharyngitis present in scarlet fever and in various septic conditions. The differential diagnosis of these has been sufficiently discussed in the section on the clinical diagnosis of diseases of the pharynx.

Prognosis.—A guarded opinion should always be given. For, although, as a rule, cases with membrane limited to the tonsils and their immediate neighbourhood terminate satisfactorily, the danger of laryngeal infection or of heart-failure is always present. A mixed infection is ever to be regarded as of serious import. As has been stated, streptococci are the pyogenic organisms most commonly present, and are apt to lead to suppuration in the adjacent structures. The staphylococcus aureus, however, appears to produce much more acute toxæmia, and cases in which it is found are very often fatal. Severe local lesions, sloughing, cellulitis, and abscess-formation, render the prognosis bad, the danger in such cases being from septicæmia and exhaustion. Extreme irregularity of the pulse, great rapidity, abnormal slowness—any one of these, especially if it develop somewhat suddenly, must give rise to the gravest apprehension. Extension of the membrane to the larynx or nose is a serious complication.

One matter of practical importance to which reference must be made is the date at which the case comes under treatment. The mortality is very distinctly lower among patients treated with antitoxin during the first two days of the illness than in those in whom the injection of the serum has been postponed to a later period.

Treatment.—Isolation of the patient, absolute rest in bed, nourishing easily-digested food—for the most part milk with strong soups—these, with abundance of fresh air, are, of course, of great importance in the treatment of the disease.

It is now very generally recognised that in **antitoxin** is to be found the most valuable remedy at our disposal, and as it has been conclusively shown that no serious inconvenience attends the use of the serum, it should be employed in every case of suspected diphtheria, without delaying until a bacteriological report is obtained. The argument in favour of early injection is, that while, if given in sufficient doses, antitoxin neutralises the bacterial products circulating in the blood, it cannot repair those degenerative changes in the tissues, and notably in the kidneys, heart, and nervous system, to which they have given rise.

Of the various forms of antitoxin in the market, those containing the largest number of immunisation units per cubic centimetre are to be preferred; the large quantity of some sera which it is necessary to inject is a drawback and may possibly be a danger. The antitoxin should be injected beneath the skin of the abdomen or interscapular region, the syringe should be sterilised, and the whole operation carried out, as far as possible, with antiseptic precautions. The age of the patient has not much influence on the dose of the serum. A severe case requires 3000 units, but if the larynx be affected, 4000 units should be given. Should no improvement be manifested the injection may be repeated in from twelve to twenty hours, but with these large doses this is seldom needed. In a mild case from 1000 to 1500 units may be given. We judge of the severity of the case (so far at least as the dosage of antitoxin is concerned) chiefly by the local lesion. The effect of the antitoxin is often very marked; the temperature falls, the general condition and aspect of the child improve in a manner little short of marvellous, and the membrane appears to become loosened and is gradually got rid of. In the case of laryngeal diphtheria this may increase the already existing dyspnœa, and as, in some cases, it does so to such an extent as to necessitate the performance of tracheotomy or intubation, it is well to be prepared for such an emergency, and to warn the parents of its possibility. Having given a dose of the serum we await events and do not repeat it unless absence of improvement in the general condition, a spread of the membrane, or a rise of temperature, occur. In comparison with the benefits accruing from the use of antitoxin, the dangers alleged to follow it seem almost negligible. That general or local erythema may occur is certain; indeed, rashes are seen in about one-fourth of the cases treated with large doses, and they generally develop between the eleventh and twenty-third day. Local erythema may go on to abscess-formation, for which, however, neglect of due antiseptic precautions must be blamed. Albuminuria is said to be more frequent when antitoxin is used. The actual facts of the case in this particular can only be discovered by statistical methods, and, in any case, the condition is no more formidable than the ordinary albuminuria of diphtheria. Pains in the joints, and rises of temperature, may also be sequelæ of the treatment. They occur at about the same time as the rashes, and may be associated with them. In fact, any combination of these three symptoms—joint-pains, rashes, and feverishness—may be observed.

What has been said refers to pure diphtheria; in cases of streptococcal or mixed infection the anti-streptococcic serum may be injected, but the results of the procedure have so far proved unsatisfactory.

Of internal remedies, the best at our command are the tincture of the perchloride of iron and the liquor hydrargyri perchloridi. To a child of a year old we may give of the former 1 drachm, of the latter 2 or 3 drachms, in the day. The iron may advantageously be combined with chlorate of potash. Stimulants are required and should be given freely on the slightest sign of a flagging pulse; alcohol, digitalis, strophanthus, strychnine, and camphor are those on which we most rely. The use of internal specific remedies has of late years been much discounted by the introduction of antitoxin.

The local treatment, however, remains of much importance. What is chiefly to be aimed at is the mechanical cleansing of the throat, and the removal of poisonous substances by large and frequently repeated douches of bland non-irritating fluid. Strong antiseptics are much less required than was formerly the case, and such simple lotions as saline solution, boric lotion, or solution of borax are to be preferred. If the irrigation of the throat cannot be carried out by syringing through the mouth, an attempt may be made to inject the fluid through the nose; but when the performance is much resisted and leads to great struggling, it is better to desist for the time than to cleanse the throat, perhaps imperfectly, at the risk of wearing out the patient's strength. Besides the douche, the throat may be swabbed out at intervals with boroglyceride, tincture of iodine, &c., or the douche may to some extent be replaced by the spray. One of the best applications which can be made by this means is a dilute solution (1 in 2000) of corrosive sublimate. In nasal diphtheria the spray is of particular value. Older children are able to gargle the throat, and this may partially, if not entirely, replace the use of the douche.

In laryngeal diphtheria the spray is again of value, and the patient should be kept in the moist atmosphere of a bronchitis tent, to the steam of which the vapour of eucalyptus or benzoin may advantageously be added. In these cases it is of the greatest importance to be prepared to perform intubation or tracheotomy should such become necessary. The chief indications for interference are these: increasing stridor or cyanosis, and inspiratory retraction of the less supported portions of the chest. These signs may be due to the spread of the membrane, or to its becoming loose and blocking the glottis. Modern practice tends to favour intubation as opposed to tracheotomy, and the former is now carried out even in very young infants. Except in the following circumstances it is generally to be preferred:—(1) In diphtheria rapidly descending into the air-passages; (2) in gangrenous diphtheria, and in cases where pneumonia exists; in these the pressure of the cannula is apt to cause ulceration of the larynx; (3) in instances where the case cannot be kept under constant medical surveillance, so that the tube may be replaced if it be coughed out, or removed and cleaned should it become blocked.

We do not propose to discuss the method of operating in, or the risks of, tracheotomy; suffice it to say that, though rendering the outlook bad, pneumonia does not contra-indicate its performance. Intubation, however, falls more within our province, and though nothing can replace actual practice in the operation on the cadaver, a few hints may prove of service.

O'Dwyer's tubes are commonly employed, and supplied with them are special instruments for intubation and extubation. Before the tube is introduced a thread is tied to it in order to prevent its being swallowed should it slip into the œsophagus. The child is placed on the nurse's knee, the head is held quite straight, a gag is inserted into the left (*i.e.*, the patient's left) side of the mouth and opened sufficiently to admit of the passage of the index finger. If the mouth be opened too wide the larynx sinks and the operation is rendered more difficult. The left index finger of the operator is passed along the right side of the child's mouth, the epiglottis is pulled forward, and with the right hand, the intubator armed with the tube—the thread of which is not tightly stretched but held loosely—is passed into the mouth and guided by the finger over the epiglottis. When the tube is released it falls into the larynx and can be felt in position. For extubation two courses are open: we may either depend entirely on the extubator, cutting short the thread attached to the tube, or we may fasten the thread to a piece of sticking-plaster attached to the cheek and use it to remove the tube. The former plan is the more difficult, but has the advantage of preventing a restless child from pulling out the tube; in the latter proceeding it is often necessary to tie the patient's hands. The tube may remain *in situ* for a total period not exceeding eighty hours. It should be removed at intervals, and again replaced when the breathing becomes laboured. In cases of tracheotomy it is found that pneumonia is most likely to supervene about the third day; in intubation it is most frequently noticed about the sixth or seventh.

In **diphtheria of the vulva** more powerful antiseptics should be used, and all efforts made to limit the disease and to prevent infection of the pharynx.

During convalescence great care should be taken to maintain the recumbent posture as much as possible. By doing so the danger of syncope is guarded against. **Post-diphtheritic paralysis** disappears spontaneously in the majority of cases, but recovery may be hastened by the use of electricity and massage, and by intramuscular or hypodermic injection of strychnine.

TYPHOID OR ENTERIC FEVER.

The disease known to the physicians of half a century ago as "infantile remittent," "gastric," or "worm" fever, has, for many years, been recognised as true typhoid or enteric fever, and to Dr. Samuel West is due the credit of having been one of the first to point out—as the result of his observations on its morbid anatomy—the identity of the disease with the "simple continued fever" of the adult.

While the youngest infant may suffer from typhoid, and even the *fœtus in utero* be infected from the maternal blood stream, the disease is rare in children under two years of age, and is usually met with in those over five. Though the majority of cases appear to be mild, and though the anatomical changes, while in the main agreeing with those of the adult, are certainly characterised by the small number and size of the intestinal ulcers, yet the mortality rate of typhoid in the child (as ascertained by statistics) varies considerably. Some observers place it as high as 14 or 15 per cent., others, and among them most authorities on pædiatrics, as low as 5 or 7 per cent. General experience appears to confirm the idea that the course of the disease is less severe than in later life.

Symptoms.—We do not intend to do more here than point out the chief features in which the enteric fever of the child departs from the adult type.

The disease is usually ushered in gradually by headache and loss of appetite, and very often by vomiting, which recurs from day to day. In most instances there is diarrhœa, though this is rarely severe, and not infrequently disappears or even becomes replaced by constipation as soon as the patient is strictly dieted. The **temperature curve**—that most important diagnostic sign—is, to a great extent, that with which we are familiar. It is, however, more remittent, and a termination by crisis is somewhat more common at this period of life than later. On the whole, the duration of the fever is less than in the adult, this being due to the shortness of the fastigium, and to the rapidity with which, after the acme is reached, the defervescence begins. In most cases the fever lasts between thirteen and twenty-three days, but abortive or more protracted forms may occur. As a rule, the temperature reaches 104° or 105° Fahr. during some part of the disease. In young infants exact observations are scanty, but, so far as is known, the course of the fever is more remittent, and its duration less, than in older children.

The **relative slowness of the pulse-rate**, so suggestive in the adult of the onset of enteric fever, is not a marked symptom in the child. The pulse, at this age, is usually quickened in direct proportion to the temperature, and the younger the patient the more rapid does it tend to become. Irregularity or comparative slowness is not very common; on account of the small size of the pulse-wave, dicrotism is difficult to detect.

As has been said, **constipation** is not uncommon; indeed, the absence of diarrhœa is to be looked for in a properly dieted case. Under favourable circumstances the motions do not exceed two in the day, and are at least partially formed. In severer cases, especially where the diet has not been properly regulated, the stools are more numerous, liquid, and ochre-like. Hæmorrhage and perforation are very rare; the occurrence of a severe attack of colic may, however, for a time lead to the suspicion that an ulcer has given way. The **tongue** is seldom clean throughout the illness, but equally seldom does it become dry and blackened. At first it is covered with a creamy layer of fur, the tip and edges remaining red; as the case progresses, the organ assumes a drier and somewhat glazed appearance, and is often slightly brown on the surface. The lips become dry, the patient picks at them, and they become covered with tags of ragged epithelium. The mouth and teeth usually remain free from sordes, and, although the breath has a somewhat heavy odour, fœtor is absent. The abdomen is tumid, rarely tympanitic; tenderness is of little diagnostic importance; and gurgling in the right iliac fossa is common to this and to many other intestinal disorders.

The **roseolar eruption** is pathognomonic of the disease. When it does occur (for it is even less constant in children than in adults) it appears somewhat early—from the fifth to the tenth day. **Enlargement of the spleen** is very common, and is of great importance in the recognition of the disease. Since little reliance can be placed upon percussion in estimating the condition of the organ, the increase in size must be a palpable one.

In almost all cases we find more or less **bronchial catarrh**; the breathing is often so shallow and superficial as, at first, to seem unaccompanied by rhonchi, but when the patient takes a deeper inspiration they are developed. So constant is this symptom that, even in the absence of other signs, a typhoid type of temperature with slight bronchitis is very suggestive of enteric fever.

Nervous disturbances are somewhat rare in children; headache and apathy, moderate delirium, or, in infants, violent screaming, are among the most common. The older the patient, the more liable is he to develop cerebral symptoms.

In the ordinary case of typhoid, then, the following are the chief symptoms:—A gradual onset with vomiting and headache, a markedly remittent temperature, quickened pulse, constipation or slight diarrhœa, characteristic tongue, roseola, enlargement of the spleen, bronchial catarrh, and slight nervous symptoms. Not all of these, however, are invariably present.

Complications and Sequelæ.—The course of the disease is very variable, and, in certain instances, many other symptoms and complications may be observed. With regard to the temperature curve, the frequency of crisis has been mentioned. Again, some cases are ushered in by a sharp rigor; in other instances the temperature is inverted—*i.e.*, is higher in the morning than in the evening. In addition to the nervous symptoms enumerated, tremor, coma, spasm, contractures, cervical rigidity, ptosis, squint, amblyopia, and hemiplegia have been noticed; hyperæsthesia of the skin is more common than in the adult. Transient aphasia appears to be relatively frequent in enteric fever; it usually occurs during the lysis or in the convalescence, and lasts for from one to two weeks. Subsultus tendinum, picking at the bed-clothes, and incontinence of urine and fæces are rare—indeed, almost unknown. Vomiting is very common and may be persistent; epistaxis is frequently observed, both at the onset and during the course of the disease. In some cases an attack of tonsillitis is the first symptom. Among the exceptional complications is noma; aphthous stomatitis, thrush, otorrhœa, and parotitis are much less rare. In the last-mentioned, suppuration is to be feared.

The most frequent pulmonary complications are lobular and hypostatic pneumonia; croupous pneumonia, empyema, gangrene of the lung, and ulceration of the larynx are also occasionally met with. Albuminuria and retention of urine are not very often present. In some cases dropsy, without evidence of nephritis, has been seen; it is probably to be attributed to an hydræmic state of the blood, with cardiac weakness. The early appearance of the roseola has been mentioned; owing to sweating, sudamina are common, and, in rare instances, scarlatiniform or other erythemata may develop during the period of fever. Their significance is unknown; they are only of importance in that they may lead to an erroneous diagnosis. Bed-sores, abscesses, and boils are not infrequent in ill-nourished children; synovitis, epiphysitis, and periostitis are uncommon. Finally, enteric fever may be complicated by one of the other infectious diseases: diphtheria, scarlatina, chicken-pox, or the like.

Course.—After convalescence, recovery is rapid. The patient is much emaciated, and is generally found to have grown considerably in height during his illness. In evidence of this, striation of the skin in various regions and, in particular, just below the knees, is often to be seen. Both loss of hair and retardation of the growth of the nails are common. As in the adult, relapses occur.

The **prognosis** depends on the severity of the case, but, on account of the comparative absence of the two great dangers—hæmorrhage and perforation, is not usually very grave.

Diagnosis.—Since the introduction of the serum reaction of Widal, the diagnosis of typhoid has been rendered much less uncertain, and doubtless that vexed question will soon be settled, as to whether such a disease as "gastric fever" really exists, or whether the cases are actually slight attacks of enteric. The chief conditions from which the disease has to be distinguished are acute tuberculosis, and, perhaps more particularly, tubercular meningitis, and tubercular peritonitis in its early stages. In typhoid the regular temperature, the occasional diarrhœa, the enlarged spleen, the tumid abdomen, the more febrile condition of the tongue and mouth, the steady pulse, and the fact that the headache ceases before the delirium and other head symptoms begin ; these, with the roseola and bronchial catarrh, are the chief symptoms on which we base our diagnosis. Against them we may place the irregular temperature and higher pulse-respiration ratio in acute tuberculosis ; the slow, irregular pulse, the constipation, retracted abdomen, and continued headache of tubercular meningitis. Ehrlich's diazo reaction is of even less diagnostic value than in adult life. Cases of broncho-pneumonia and croupous pneumonia, in which the signs are masked, are often mistaken for typhoid, and it is only by attention to the course and special symptoms of the diseases that we are enabled to differentiate between them. It should be remembered that pneumonia may complicate typhoid fever.

The **treatment** of typhoid fever in the child presents no special features. Strict isolation and thorough disinfection of the fomites should be observed. We advocate the expectant treatment and do not consider that attempts at intestinal antisepsis or the systematic use of cold baths fulfil any good object. The latter, in particular, seems contra-indicated in children, who bear the external application of cold badly. To keep the patient in bed and to limit the diet to milk are the first steps. The milk should be diluted with water, or, if the diarrhœa be marked, with lime-water ; and the stools should be examined daily, so that if curd be passed it may be detected, and the milk still further diluted or its amount diminished. As a routine practice it is advisable to give a purgative (2- to 4-gr.) dose of calomel when the case first comes under observation ; this seems perfectly safe and, by emptying the bowel, tends to limit the severity of the poisoning. The drug may be repeated, preferably in divided doses of $\frac{1}{4}$ to $\frac{1}{2}$ gr., should obstinate constipation demand it, or enemata of soap and water may be given. It is well, especially in private practice, to order a mild diaphoretic, such as Mindererus spirit or a dilute acid mixture. If the temperature rise so high as to be in itself a danger, the child may be sponged with tepid water, collapse being watched for and averted by stimulants. Of antipyretic drugs, phenacetin and antipyrin in small doses are well borne, and are probably the safest ; in an ordinary case they will scarcely be needed. With the patient upon an exclusively milk diet, diarrhœa is seldom so troublesome as to call for interference; should it be excessive, bismuth—if necessary, with a little opium—and starch enemata may be ordered. Bronchitis and other complications need the usual treatment; and, in the administration of stimulants, all the care and watchfulness of the physician will be called forth.

SCARLET FEVER.

Etiology.—Scarlet fever is rarely absent from any large community; sporadic cases are frequent, and at more or less regular intervals the disease appears in an epidemic form. Various micro-organisms have been described by different observers, but the true cause of the disease is as yet unknown. The infection is an extremely persistent one; the disease may be conveyed directly, by the agency of a third person, or by means of fomites. Although no age is exempt, scarlet fever is most common between the second and tenth years of life; infants under one year are rarely subject to it.

After a short **incubation** period, often of only twenty-four hours, very seldom more than seven days, and in the majority of instances from two to five days, the stage of invasion is reached. The symptoms of the **invasion** are vomiting and, it may be, diarrhœa; headache, sore throat, and feverishness. A definite rigor, or even a convulsion, is not uncommon; it is said that the latter is of somewhat serious prognostic import. The most characteristic symptoms of the invasion are the pulse-rate, the temperature, and the pharyngitis. The pulse rushes up to 130, 140, or more; the temperature rises to 102°–104° Fahr., or even higher. These two signs—the pulse-rate being in excess of what the temperature would lead us to expect—occurring suddenly in a healthy child, are very suggestive of scarlatina. On examination, the throat is seen to be bright red or deep crimson in colour, the mucous membrane of the tonsils and uvula is swollen, and yellowish patches of exudation are commonly seen on the tonsils. The rich, red, velvety aspect of the throat, with the swelling and intense, somewhat punctate, hyperæmia, are very characteristic where well marked.

In a normal case the **exanthem** appears in from twelve to thirty hours after the invasion; in other cases, and these by no means favourable ones, it is delayed for a little time. It is first seen upon the neck and chest, spreads over the body less regularly than does the rash of measles, and is often visible in the neighbourhood of the larger joints and upon the inner side of the thighs almost as soon as upon the chest. The face is, to a great extent, spared; the parts most liable to show the eruption are the temples and forehead; the cheeks have merely the febrile flush, while the mouth and its neighbourhood remain pale. On the palms and soles the eruption is ill-defined. The rash consists of very numerous minute bright red spots coalescing to form a diffused blush like that produced by a mustard plaster, disappearing temporarily upon pressure, and conveying a sensation of pungent heat to the examining hand. It is best seen upon dependent parts of the body, on the inner aspects of the thighs, and in the flexures of joints. Even when the rash is fully developed it is usually possible to make out the punctate appearance over some part of the skin. In some cases a crop of sudamina is also present, and at times, in place of being uniformly distributed, the scarlatinal eruption is irregular and blotchy in its character.

The **temperature** continues to rise as the rash develops, and both attain their maximum by the third or fourth day. The rash then begins to fade in the same order as that in which it appeared, and the temperature falls, usually reaching normal by the fifth or seventh day. After the rash is gone, petechial lines occasionally remain in the creases of the joints, and may, at times, possess some diagnostic value.

Symptoms.—At the outset of the disease the tongue is often characteristic. It is covered with creamy whitish fur, through which the hyperæmic papillæ project. In the course of a day or two the fur disappears and leaves the tongue red and glazed looking, with prominent red papillæ upon its surface. To the first of these the name of "white strawberry," to the second that of "red strawberry," tongue is given. Though very often seen in scarlatina, similar changes may occur in ordinary gastric catarrh. When, in from six to ten days from the onset, defervescence is complete, convalescence is said to begin, and, by this time, desquamation, first noticed as a slight scaliness over the front of the chest and neck, is found. The epidermis of the body peels off rapidly, at times in large flakes, and in the course of a week or two is entirely removed. But the skin of the palms and soles is much more slow in desquamating, and the process is rarely complete before the end of the seventh or eighth week.

During the whole of these eight weeks **complications** may arise. **Pharyngitis.**—In an ordinary, simple scarlatina the throat lesion is at worst a follicular tonsillitis with slight glandular enlargement, the whole lasting but a few days. It is, however, quite common to meet with secondary sore throat at a later period of the disease, and, in somewhat rare instances, true diphtheria may appear, either at the invasion or as a secondary throat affection. This must be carefully discriminated from the pseudo-diphtheritic membranes about to be mentioned. In a variety of scarlet fever to which the name of **scarlatina anginosa** has been given, the throat lesion is severe and runs a protracted course, prolonging the fever curve for several weeks. The tonsils are covered with yellowish patches, the glands of the neck are greatly swollen, the cellular tissues tense and painful; septic false membranes may appear in the pharynx; the tonsils may suppurate or even become gangrenous; ulceration of the palate and pharynx may occur, and possibly lead to fatal hæmorrhage. A sanious nasal discharge is common, abscesses may form in the glands of the neck, phlegmonous inflammation of the cellular tissue may take place, and the patient die from exhaustion or toxæmia. There can be little doubt that scarlatina anginosa is due to a mixed infection. By some it is included among the forms of malignant scarlet fever.

Albuminuria.—The urine should be systematically examined at least twice a week after desquamation has begun. Small quantities of albumin are very commonly found and have little significance except in so far as they put us upon our guard, and warn us that the kidneys are enduring an additional strain. True nephritis may develop at any time during the period of convalescence—most commonly about the end of the second week—and is often first indicated by sudden anasarca—particularly of the face and eyes—and the urine when examined is found to be diminished in amount, loaded with albumin, and containing blood and casts.

Otitis media is not infrequent, and is most usually seen during the earlier part of the disease, while the throat is yet acutely inflamed. It causes the temperature to run up, but, unless the ears are examined, may easily be overlooked until the membrana tympani suddenly ruptures and pus escapes, giving immediate relief to the symptoms.

Post-scarlatinal rheumatism is in all probability nothing else than acute rheumatism superadded to the scarlatinal poisoning. It manifests itself by an arthritis, in which the effusion is usually slight and the periarticular structures are chiefly involved; it may lead to endocarditis or pericarditis, or these may develop independently of the joint affection. Chorea is not infrequently seen to succeed scarlet fever. It is thought by some that the occurrence of rheumatism is predisposed to by neglect of the state of the bowels. Occasionally a septic arthritis may occur and go on to suppuration. It probably follows absorption from the throat, and is, apparently, quite distinct from ordinary post-scarlatinal rheumatism. As rarer complications and sequelæ of scarlet fever we may mention empyema, buboes, boils and abscesses, eye affections, and eczema.

Varieties.—Malignant scarlet fever is not common. It may be that the patient dies on the second or third day of the disease, apparently from the severity of the intoxication. In such cases, further than the severity of the symptoms, no peculiarity is noticeable. In the adynamic or ataxic type the rash is scanty or absent; high temperature, prostration, and nervous symptoms are found. In the hæmorrhagic form we see the disease fatal in a day or two, with petechial rash and hæmorrhages from various mucous surfaces, as well as into the viscera.

Convalescence cannot be regarded as complete before six weeks have elapsed, until desquamation is over and all discharge from the ear or nose has ceased. Scarlet fever is infectious throughout; the danger is greatest during the period of desquamation, but the disease may certainly be conveyed from the initial sore-throat by the breath; the other secretions and discharges are probably also infectious. **Relapses** have been described but are very rare. The **protection** afforded is fair; second and third attacks are not uncommon. The period of **quarantine** after exposure to infection lasts a fortnight.

Diagnosis.—We have already dealt (p. 75) with the diagnosis of scarlet fever. The rash has to be distinguished from those of measles, German measles, and erysipelas, from the prodromal eruptions of smallpox, and from the eruptions sometimes occurring in quinsy and diphtheria, as well as from the other forms of erythema. When the temperature rises during convalescence it is right to examine in succession the throat, the glands, the ears, the joints, and the heart, and to enquire into the state of the bowels and urine. By this means the cause of the rise of temperature will almost always be discovered. Where the course of the temperature is carefully watched, and the urine examined, it is unlikely that any complication will escape observation even for a time.

The **prognosis** of scarlet fever is extremely uncertain; the disease is a treacherous one, and, even in an apparently slight case, a grave complication may develop; hence a guarded opinion must always be given. The gravity of the illness is influenced primarily by the virulence of the infection and the resistance of the patient. Thus, some epidemics have a higher mortality than others, and, even in mild epidemics, we not infrequently hear of several members of one family being cut off, a circumstance which speaks for an hereditary inabilty to cope with the disease. The average mortality is perhaps about 4 to 8 per cent.; somewhat higher in children under the age of five. Hospital statistics will naturally give a rather smaller proportion of fatal cases. Among the chief unfavourable signs we reckon hyperpyrexia, great prostration and collapse, abnormal and badly developed eruption, persistent vomiting and diarrhœa, severe nervous symptoms, and the presence of a complication such as ulcerative or gangrenous pharyngitis, nephritis, suppurative arthritis, and the like.

Treatment.—The precautions usual in the other infectious diseases, as regards isolation of the patient, preparation of the sick-room, and disinfection, must be observed. In the treatment of an ordinary case of scarlet fever very simple measures alone are necessary. The diet should consist chiefly of milk and farinaceous substances; vegetable soups, a moderate allowance of fruit, and white fish are permitted during the latter part of the illness, due regard being paid to the age of the patient. Meat, strong soups, eggs, and other highly nitrogenous substances should never be given during the course of the disease. The patient is to be kept in bed for from three to four weeks; after this period, if all be going well, he is allowed up. It is probably safer, and in most private houses no other course is open to us, to keep the patient in-doors until desquamation is complete. In fever hospitals, where special facilities exist, convalescent scarlet patients are usually allowed into the grounds after the fourth or fifth week of the disease.

Of general remedies it is the practice of many parents and nurses to give a little sulphur at the beginning of an attack. This is believed to assist in the development of the eruption, and, in so far, to be beneficial. If not of any great value the remedy is at least a harmless one, and its gently laxative action may be useful. As the sulphur is given the child is often placed in a warm bath, and this too has the effect of "bringing out" the rash. There is no doubt that, in cases with high temperature and general prostration, where the exanthem is not well marked, the warm bath is useful and relieves the patient.

The throat, however, has the principal claim on our attention. It should be gargled or syringed frequently—every two hours or, in in a severe case, oftener—and the fluid should be bland, cleansing, and antiseptic. Permanganate of potash, sufficient to give a pink tinge to the water, chlorate of potash ($\frac{1}{2}$ drachm to the pint), borax (1 drachm to the pint), bicarbonate of soda (1 drachm to the pint), and chlorine water are all suitable substances. The last of these is extremely soothing where the irritation is great. In addition to gargling, the throat may be painted or swabbed with equal parts of boroglyceride and glycerine. During the course of the disease a daily movement of the bowels, should it not occur naturally, ought to be secured by the use of gentle laxatives. As desquamation begins inunction with 1 or 2 per cent. carbolic oil is advised by some. When convalescence is complete, tonics and a change of air are beneficial.

Scarlatina anginosa needs more active treatment. To control the temperature we may prescribe quinine, but it is against the throat lesion that our efforts are chiefly directed. Besides the lotions advised above the remedies used in the local treatment of diphtheria should be tried, and in particular frequent irrigation with large quantities of bland fluids. In **scarlatina maligna** the prostration is combated by feeding and free stimulation. A hot or cold wet pack or bath, mustard bath, or cold affusion to the head while the patient sits in a warm bath, may be tried with the view of bringing out the rash and reducing the temperature. In the hæmorrhagic variety general or local astringents are required. The treatment of the complications—of acute Bright's disease, rheumatism, heart disease, otitis, &c.—is exactly the same as when these occur independently of scarlet fever.

MEASLES—RUBEOLA—MORBILLI.

Etiology.—Measles generally appears in the form of an epidemic, scattered cases being comparatively infrequent; in this respect, therefore, it differs to some extent from scarlet fever. The infective agent is unknown, but is contained in the nasal secretion, the bronchial mucus, and the blood. The disease is conveyed by the breath and by fomites. Age has little effect on the liability of unprotected persons to take measles; though it is rare in infants under six months, it is by no means unknown in them.

The period of **incubation** lasts for from nine to twelve days, or, calculating from the date of infection to the appearance of the exanthem, from thirteen to sixteen days.

The **invasion** is sudden, with chill, often vomiting, and sometimes diarrhœa; and also the signs of coryza—sneezing, watering at the eyes, sore throat, and hard painful cough. Epistaxis is not uncommon. With these symptoms the temperature rises to 101° or 102° Fahr. or higher; the pulse and respiration are also quickened. On examining the child about the second or third day, the eyelids are found to be swollen, and, by everting them, it is often possible to detect the earliest signs of the eruption upon the conjunctiva. The throat is congested, its colour is dark purplish-red, and here, too, a mottling may usually be seen some hours before the rash appears on the skin. Koplik has recently described the occurrence of small bluish-white spots with red bases on the mucous membrane of the cheeks and lips. These appear during the pre-eruptive stage of measles, and are said to be pathognomonic of the disease.

On the fourth day, rarely sooner or later, the typical **exanthem** appears. It is first seen upon the temples, and behind the ears over the mastoid processes. It spreads rapidly and fairly uniformly over the body, attaining its maximum intensity within thirty-six hours—*i.e.*, by the sixth day. It appears on the wrists very soon after it is noticed on the face; the legs are the last parts of the body to become affected. The eruption consists of closely-set, dull, reddish papules, varying from the size of a pea to that of a bean. They have a tendency to become arranged in a crescentic or horseshoe-like manner, and temporarily fade on pressure. In marked cases they become confluent, and as a result of this the rash may, in places, resemble that of scarlatina; it is, however, never of so uniform and bright red a colour. From about the sixth day the eruption begins to fade, in many cases leaving small petechiæ behind it. A branny desquamation commences on the eighth day, and lasts until the eighteenth, when convalescence may be regarded as complete.

The **temperature** curve of measles is somewhat peculiar. With the onset of the catarrhal symptoms the thermometer shows a rise to 101° or 102° Fahr., but by the third day the fever is gone, and the morning temperature is normal or nearly so. As the rash appears, the temperature again rises, and reaches its maximum simultaneously with the full development of the eruption on the sixth day of the illness, by which time it may have attained 104° or 105° Fahr. After this period the temperature no longer follows the course of the exanthem; for, whereas the latter fades gradually, the fever disappears by a somewhat sudden defervescence, of seldom more than two days' duration. The patient, therefore, is free from fever by the eighth day. When the temperature remains up after the tenth day some complication should be suspected. Among those most likely to cause feverishness are pulmonary complications, otitis, pharyngitis, and enlarged glands. Though the above form of temperature curve is that most commonly seen, it is not invariable. The fall to normal on the third day may not occur, or the temperature may gradually rise from the date of invasion until the sixth day. In all cases, however, one feature is constant—viz., the fever increases with the development of the rash. This is very characteristic of measles.

Symptoms and Complications.—The coryzal symptoms are very marked; the cough is hard and brassy, and, in children liable to it, true pseudo-croup may develop. During the height of the eruption the face is blotchy and swollen; there is a certain degree of conjunctivitis with marked photophobia, or, it may be, some more serious ocular inflammation. Prodromal rashes are uncommon, but may occur in the form of erythemata, and give rise to difficulty in the diagnosis. During the acme of the eruption there is often profuse sweating. The tongue is furred and the throat painful; the pharyngitis, however, is rarely so severe as in scarlet fever. Vomiting is often met with, and so is diarrhœa; the latter is sometimes intractable and may be of dysenteric nature, there being a little blood in the stools, accompanied by colic and tenesmus. Bronchial catarrh is a very constant symptom, and the spread of this to the smaller bronchi, with consequent broncho-pneumonia, is to be looked upon as the great danger of measles. The broncho-pneumonia is most often found in the lower lobe; croupous pneumonia and empyema are much less common. Apart, however, from actual inflammation of the lung, the bronchial catarrh may take on the type of "suffocative bronchitis," in which, without there being much bronchial secretion, the wide-spread œdema and swelling of the mucosa obstruct the entrance of air to such a degree as to prove fatal. In these cases, besides the diffuse bronchitis, large areas of the lung are found, *post-mortem*, to be collapsed. Although less frequent than in scarlatina, otitis media is a not uncommon complication; it leads to chronic otorrhœa, and may ultimately become infected by the tubercle bacillus. Glandular enlargement is common in the later stages of measles, and is very liable to become the seat of a tubercular infection. Symptoms involving the nervous system are comparatively few. Delirium and even mania have been noticed; convulsions rarely occur during the period of invasion, and when they do are of little significance; but occurring in the eruptive stage, or along with a pulmonary complication, they are of grave import. Among the less usual complications of measles, diphtheria, chickenpox, and acute pemphigus (a serious lesion) may be mentioned. Whooping-cough, on the other hand, is very commonly met with, and, especially in young children, renders the outlook less promising.

The **sequelæ** of measles are numerous, and chiefly take the form of chronic inflammations of low type, on which the tubercle bacillus is readily implanted. Thus, otorrhœa may lead to caries of the temporal bone, glandular enlargement to tubercular abscess, chronic broncho-pneumonia to phthisis, or chronic diarrhœa to abdominal tuberculosis. These, with blepharitis, phlyctenular conjunctivitis and keratitis, eczema, impetigo, and subcutaneous abscesses, are so commonly known as the "dregs of the measles" as scarcely to need mention. A rare, but serious, sequela is noma. Nephritis is seldom observed, and the same applies to purpura, though small petechiæ, resulting from the eruption, are not infrequently seen.

Anomalous types of measles are few and unimportant. Measles without coryza—*morbilli sine catarrho*—and measles without eruption—*morbilli sine morbillis*—have been described. Malignant forms, hæmorrhagic and adynamic, though more frequent in some epidemics than in others, are, on the whole, seldom met with.

The disease is highly contagious in its initial stage—that is, before (in many cases) its nature can be recognised. It is, therefore, almost impossible to isolate the patient sufficiently early to prevent the spread of infection. For this reason, then, while it is our duty to recommend all possible measures to limit the diffusion of the disease, it is advisable to warn parents that there is little likelihood of unprotected children escaping when one of their number has taken measles. With the appearance of the exanthem the infectiousness diminishes, and as soon as desquamation is complete—by the eighteenth day—the patient may be allowed to mix freely with his fellows. **Protection** is good, and second or third attacks are less common than has been supposed. The period of **quarantine** after exposure to infection is sixteen days.

Under favourable circumstances the **prognosis** is good. The disease is usually mild in children under six months old, and is most severe during the first dentition. In rickety, scrofulous, and weakly children, the prognosis is less favourable, and, where the surroundings are bad and the patients neglected, measles, like whooping-cough, is the cause of a large number of deaths. The occurrence of great prostration, rapid pulse, an irregular, early-fading rash, or much bronchitis will, of necessity, give to the case a graver aspect.

The **diagnosis** rests on the exanthem, the coryzal symptoms, the temperature curve, and the presence of an epidemic. The features of most importance in the diagnosis between measles and rötheln and scarlatina have been already discussed (p. 76). The rash of typhus is less copious, darker, and more petechial, and the general symptoms are not those of measles. In smallpox the rash somewhat resembles that of measles at the first, but it soon becomes vesicular; the catarrh is absent, and with the appearance of the eruption the temperature falls.

Treatment. — Although in a mild case of measles little is needful in the way of treatment beyond warmth, rest, and a milk diet, the disease should not on this account be held too lightly. The patient must be strictly confined to bed, and the temperature of the sick-room ought to be a few degrees higher than is usual—about 70° instead of 60° or 65° Fahr. Owing to the photophobia the room should be darkened somewhat, and, on account of the bronchial and laryngeal irritation, the atmosphere may with advantage be kept rather moist. This end is gained by allowing an ordinary kettle to stand on the fire so that the steam may escape into the room. The diet should be light and fluid, and consist chiefly of milk. If the bowels are confined, a small dose of castor-oil or magnesia, or a soap and water enema may be given; more active purgatives are better avoided, lest intractable diarrhœa be set up. If the rash be not well developed the child may be placed in a warm bath, and this, with warm drinks and wrapping up the body in a blanket, will often favour its appearance. Even in an ordinary case, the cough is so troublesome as to indicate the administration of some simple diaphoretic and expectorant remedy; a little sweet spirit of nitre, ipecacuanha wine, and Mindererus spirit may be combined in a mixture. A sheet of clean wadding should surround the chest, and be changed as often as it becomes soiled with perspiration. As convalescence proceeds, tonics, such as quinine, chemical food, and cod-liver oil, should be ordered, and change of air is advisable. It may, perhaps, be mentioned that sea-air, and more particularly sea-bathing, are apt to maintain or even to aggravate any existing otorrhœa. It is well, therefore, to send patients, in whom a discharge from the ear remains, to an inland, rather than to a sea-side, health resort. Even in the mildest cases, the child should be kept in bed for a week, and confined to his room for the ensuing fortnight or three weeks. If much bronchial catarrh be present, a little gentle counter-irritation with equal parts of turpentine liniment and olive oil, and an occasional light poultice, will relieve it. Broncho-pneumonia demands the usual treatment for that disease. Should diarrhœa become severe, as when there are more than four motions in the day, it may be controlled by bismuth, opium, and ipecacuanha. If there be much conjunctivitis and glueing together of the eyelids in the morning, a little vaseline may be smeared along their edges at night, and the eyes bathed occasionally with warm boracic lotion. In more serious cases the ordinary remedies will be required.

GERMAN MEASLES—RÖTHELN—RUBELLA.

The separate existence of rötheln as an eruptive fever, analogous to, but entirely distinct from, measles and scarlatina, is now so fully recognised as to require no further discussion. Like the other exanthemata the disease breeds true. An attack confers no protection against measles or scarlatina, nor do these confer immunity against rötheln. Some of the cases resemble scarlet fever more closely than measles, and *vice versâ*. Rötheln occurs in epidemics; children between the ages of two and ten years are most liable to contagion.

The **incubation** is uncertain and probably variable, lying apparently between one and three weeks.

The symptoms of the **invasion** are slight; very often nothing is noticed until the rash appears. There may, however, be feverishness, loss of appetite, and malaise before the characteristic exanthem develops. In typical cases the **eruption** appears on the second day. It consists of minute rose-red papules or macules, coming out first on the face and chest, and spreading over the whole body within a few hours. The spots are smaller than those of measles, rarely exceeding $\frac{1}{6}$ inch in diameter; they do not tend to become arranged in crescents but rather to coalesce, and it is this coalescence which gives to some cases the aspect of scarlet fever. The rash is often itchy, fades in a day or two, and is often followed by slight desquamation. There is generally but little elevation of the **temperature** during the course of the illness.

Symptoms.—Simultaneously with the rash, slight sore-throat and coryzal symptoms are complained of; on inspection the pharynx is seen to be somewhat hyperæmic, and the conjunctivæ injected. At this period, too, one of the most characteristic signs may be noted —enlargement of the glands of the groin, axilla, and neck, and particularly of those in the suboccipital region and arranged along the posterior border of the sternomastoid muscle. The increase in the size of the glands is not great, they are separate from each other, and have, to some extent, the shotty feeling of the adenitis of secondary syphilis.

Rötheln is almost always a very mild disease, but in some epidemics malignant cases have been recorded.

The infectiousness of the disease is said to be greatest towards the end; it may be regarded as past by the fourteenth or sixteenth day. The **protection** afforded is good, and the **quarantine** enforced after exposure to infection should be about twenty-one days.

When once the **diagnosis** is assured the **prognosis** is favourable. The chief points of diagnostic importance have been alluded to in the section on Clinical Diagnosis. They are:—(1) A rash resembling that of measles in its character and distribution, but recalling that of scarlet fever in its colour and date of appearance; (2) the comparative absence of symptoms during the period of invasion, and the slight coryza during the eruptive stage; (3) the enlargement of the cervical and other glands. When distinct, this is of great diagnostic value; it must be remembered, however, that the swelling of the glands in the neck and groin is very common and results from a number of causes, such as eczema, mastoid disease, pediculosis, sores on the legs and external genitals, &c.

Very little **treatment** is required; it is on the same lines as in a mild case of measles.

CHICKEN-POX—VARICELLA.

Etiology.—The exact nature of the infective agent is unknown. It appears to be conveyed by the scabs which form on the skin, and also by the breath. When inoculated, the contents of the vesicles do not invariably cause the disease; it spreads, however, with great rapidity among children, but the poison does not seem to be very persistent. Chicken-pox occurs in epidemics recurring at short intervals; sporadic cases are also common. It is essentially a disease of childhood, being usually observed during the period of the first dentition, and but rarely in those over ten years.

The **incubation** varies between twelve and sixteen days. A fortnight appears to be the ordinary period.

The **invasion** is marked by slight fever, but by no characteristic symptoms, and the disease is not recognisable before the appearance of the **eruption** on the second day. Crops of small papules are seen on the trunk, then on the limbs, face, and scalp, and also in the mouth. They are either irregularly scattered or arranged in clusters, and very rapidly become vesicular, so that in the course of a few hours numerous small blebs like little drops of water or opalescent fluid, without surrounding areola, are strewn over the body. A few, but not all, become pustular, the pustules being occasionally umbilicated. Some vesicles usually develop in the mouth. It is characteristic of the eruption of chicken-pox that it appears in crops on successive days, so that papules, vesicles, and pustules are to be observed simultaneously. In the course of a day or two the spots dry to form scabs, and fall off in from one to two weeks, leaving transient red marks upon the skin. The amount of inflammation associated with the rash depends largely on the degree of irritation to which it has been subjected; if there has been much scratching, an ecthymatous condition may ensue. The eruption disappears without leaving any permanent trace, or, at the most, only one or two small white cicatrices. The total number of spots in an average case is from 200 to 300. It may be much less.

The **temperature** is raised to 101° to 102° Fahr., or even higher; the fever is proportionate to the eruption, exacerbations occurring as the crops of spots develop.

The **symptoms** are, as a rule, trifling, and simply those of slight pyrexia; convulsions, vomiting, and prodromal erythemata are rare. If the mouth be much involved there may be some stomatitis, while, if the eye be affected, conjunctivitis or even keratitis may occur. Nephritis is extremely rare; ecthyma and subcutaneous abscesses have been described.

Only one anomalous type of chicken-pox requires special mention —**varicella gangrænosa**, occurring usually in weakly children, in whom the spots, instead of forming scabs, become converted into gangrenous patches. A form of chicken-pox with hæmorrhage from the mucous membrane has also been described.

The disease is infectious throughout; **convalescence** is complete, and the patient is free from infection as soon as the scabs fall off—about the second week. **Relapses** are unknown, those described being probably simply recurrences of the eruption. The **protection** is good, second attacks being rare; the **quarantine** after exposure to infection is eighteen days.

The **prognosis** is good. The **diagnosis** has chiefly to be made from smallpox, and rests on the early appearance of the rash, its occurrence in crops, the coincidence of papules, vesicles, and pustules, the comparative absence of umbilication, the fact that the face is less affected than the rest of the body, and the co-existence with the disease of marks of efficient vaccination. An ordinary case of chicken-pox requires no **treatment.**

WHOOPING-COUGH—PERTUSSIS.

Though various organisms have been described, the actual exciting cause of the disease remains unsettled. The exact seat of the lesion is also obscure and the nature of the paroxysms uncertain. In cases where laryngoscopic examination has been practised, a speck of mucus has been seen lying on the congested mucous membrane of the upper part of the inter-arytenoid space, and it has been found that irritation of this area by a probe excites a paroxysm of coughing. From the fact that in cases where tracheotomy has been performed the fits of coughing continue although the glottic spasm is relieved, the seat of the disease is apparently not limited to the upper air-passages. It is further probable that, although in most instances the infective agent gains entrance by the respiratory mucous membrane, the nerve centres are afterwards directly affected by the diffusion of the poison through the system. Whooping-cough is endemic in most towns, but periodically assumes an epidemic character. Few children escape; the disease attacks most of them during the first four years of life. Under one year the malady is very often fatal. Girls are more liable than boys. Whooping-cough spreads by direct contagion, but may also (though perhaps somewhat rarely) be communicated by the agency of third persons.

The **incubation** period is usually about a week, but may lie anywhere between four days and a fortnight.

Symptoms.—Clinically the disease is divided into three stages:—(1) A period of catarrh lasting from ten to fourteen days; (2) a period of full development lasting from three to six weeks or more; and (3) a period of decline of uncertain duration.

In the first stage the symptoms are those of an ordinary bronchial catarrh; even during this period, however, the cough may assume a somewhat paroxysmal character. There is some feverishness, and more or less coryza, and, in certain cases, the disease may abort and never pass beyond the catarrhal stage. On auscultation the only sounds heard are those of slight bronchial catarrh, and even they may be absent. It is characteristic of pertussis that (unless a complication exist) the physical signs are always slight, and in no way correspond with what might be anticipated from the severity of the cough. In the second stage the typical paroxysms develop. They are most frequent towards evening and in the night-time; and in mild cases so few as 8 or 10, in severe cases so many as 40 or 60, may occur in the course of the twenty-four hours. Each attack is ushered in by restlessness and crying, or, in older children, by a tickling at the throat or by a sort of aura. The patient ceases playing and leaves his comrades—as Trousseau describes it, "*c'est alors qu'il médite sa crise*"—he rushes to catch hold of some fixed object, and, notwithstanding all efforts to repress it, the fit of coughing begins.

A series of explosive expirations ensues, and lasts half a minute or more with little or no intervening inspiration, the face becoming red or cyanosed and turgid, the veins of the neck engorged, and the eyes protruding; these are followed by a long-drawn "whooping" inspiration giving momentary relief, only, however, to be succeeded by a second, or even third, attack, the end of the paroxysm being signalised by the vomiting of glairy mucus and food. Such is the character of the seizures of whooping-cough. During the attack various results may ensue: epistaxis, sub-conjunctival hæmorrhage, petechiæ, bleeding from the larynx and pharynx are not uncommon; and more serious hæmorrhages, such as apoplexy, have been recorded. Again, the tympanum may rupture and blood be discharged from the ear.

Nervous symptoms are not infrequent; eclampsia may occur, or localised spasm, such as strabismus, or temporary blindness. The increased pressure in the lungs leads to emphysema, or even to rupture of an alveolus and to the passage of air along the septa —in some cases to the mediastinum and subcutaneous tissues. Ulcer of the frenum, from the repeated jerking of the tongue against the lower incisors, is not uncommon, but, though a useful aid in the diagnosis, is not pathognomonic of whooping-cough.

During the convulsive stage of the disease the fever disappears. The child becomes weak and thin from the exhaustion caused by the paroxysms of coughing and the interference with nutrition brought about by the repeated vomiting. The physical signs at this period are those of slight emphysema and bronchial catarrh—a rather barrel-shaped chest, a hyper-resonant note, and a few rhonchi.

During the stage of decline the paroxysms become fewer and the whoop subsides; the symptoms and signs are those of an ordinary bronchitis. Should any fresh catarrh develop, the whoop is apt to return, and this may take place for many months after the disease is past. Such a recurrence does not, of course, imply a continuance of the infection.

Complications and Sequelæ.—A few complications, resulting from the paroxysms, have already been mentioned; of others, hernia and prolapsus ani are not infrequent; a fatal glottic spasm during the fit of coughing has been described. Measles is a fairly common accompaniment of pertussis and *vice versâ*. The most frequent and serious complications are bronchitis and broncho-pneumonia, and to them the high mortality among young children suffering from whooping-cough is due. The latter is signalised by fever and rapid breathing, and sometimes by a diminution in the number of the paroxysms. Pulmonary emphysema occurs during the course of the disease, and often persists for some months, or may be permanent. Vomiting may be so severe as to constitute a danger to life; diarrhœa may also be present. Apart from the immediate sequelæ, the nutrition of the child is often so much impaired that a tubercular infection is superadded. Miliary tuberculosis, caseation of the bronchial and other glands, phthisis, &c., may occur. After whooping-cough there is usually considerable anæmia.

The infection is conveyed by the breath and expectoration, and by fomites; it continues throughout the first and second stages. Observations which have recently been made tend to show that the danger of infection is less, or even absent, as soon as the whoop develops. The correctness of this view is doubtful, and, for the present at least, it is safer to regard the disease as infectious until the stage of decline is reached. The **convalescence**, therefore, is complete in six or eight weeks—as soon as the whoop is gone. True **relapses**, as opposed to a transient recurrence of the whoop, do not occur. The **protection** is very complete, second attacks being practically unknown. The period of **quarantine** is three weeks.

The **prognosis** depends, to a large extent, upon the age and strength of the child. It is guarded, if not entirely unfavourable, in young infants, and in the weakly, scrofulous, and rachitic. Death during the paroxysms is not common, and may be due to spasm of the glottis with or without general convulsions. Extensive bronchitis and lobular pneumonia, and (a common accompaniment of them) collapse of the lung, are serious complications. In any individual case the prognosis depends, *cæteris paribus*, on the number and severity of the paroxysms.

The **diagnosis** is easy when the cough is heard and the whoop well developed. If we do not hear the cough it may be artificially brought on by pressing on the larynx or by depressing the tongue. A history of cough, worse at night, coming on in fits, and followed by vomiting; and the turgescent, somewhat livid face, with swelling about the eyes, are together sufficient to warrant a diagnosis. Spasmodic cough, somewhat resembling whooping-cough, is met with in pleurisy with effusion and empyema in young infants, and in enlargement of the bronchial glands. In these cases one is often in doubt for the time being as to whether the disease is not complicated with pertussis. If care be exercised, laryngismus stridulus, retropharyngeal abscess, and pseudo-croup will not be mistaken for whooping-cough.

Treatment.—The great error to be avoided is the advice to let whooping-cough run its course. Apart from the more immediate dangers of the disease—exhaustion and the like—the fact has to be borne in mind that the longer the cough persists the more readily will tubercle be implanted, and the greater is the risk of emphysema being set up. This last-mentioned possibility is one very often overlooked; we have seen a considerable number of cases of severe emphysema in children of eight to ten or fourteen years, where the condition could be distinctly traced to an attack of whooping-cough several years previously.

The usual strict isolation must be carried out; the sick-room should be well ventilated and fairly warm. If the weather be fine the child should, in uncomplicated cases, be allowed to go out into the fresh air every day. The diet must be nourishing, but care should be taken not to overload the stomach, as vomiting will thereby readily be set up. Food should therefore be given in small quantities and frequently, and it is advisable to instruct the nurse to feed the child after an attack of coughing and vomiting has occurred. By this means we are enabled to take advantage of the interval, and to ensure that the meal will not immediately be returned.

Innumerable drugs have been employed with the object of lessening the severity of the paroxysms and shortening the duration of the disease. Belladonna in large doses, increasing until its physiological effects are obtained, is one of the most reliable. For a child of two or three years, 5 to 10 minims of the tincture every two or three hours may be prescribed, and the amount gradually increased until dryness of the throat, flushing, or dilatation of the pupil is produced. Antipyrin is also a drug of great value. To a child of two the dose may be 4 to 6 grains every two or three hours, and if this produce no effect more may be given. With both antipyrin and belladonna the action of the drug must, of course, be carefully watched. Quinine, in doses of about 1 gr. for every year of the patient's age, and chloral hydrate, or preferably butyl-chloral hydrate in somewhat larger doses, are also useful in certain cases. The bromides are favourite remedies, and with them several of the foregoing may advantageously be combined. In recent years bromoform has been much lauded, but has not come up to the expectations formed of it. It may be prescribed with alcohol and a syrup. In addition to internal medication, the vapours of carbolic acid and creosote, produced by heating over a spirit lamp, are at times of great service. A similar line of treatment was formerly much in vogue, and is still practised in some places; the patients were taken to live near gasworks or a tannery, in order to inhale the fumes. Insufflations of quinine, cocaine, &c., have also been recommended; caution must be exercised in the use of the latter drug. After the paroxysms have almost disappeared, cod-liver oil and tonics should be ordered, and a change of air often hastens complete recovery.

The medicinal treatment of whooping-cough may thus be summarised:—During the first stage we order a simple expectorant mixture; during the second a mixture containing antispasmodic remedies such as chloral, belladonna, antipyrin, and bromide; and in the stage of decline, chiefly tonics and cod-liver oil are indicated.

MUMPS—SPECIFIC PAROTITIS.

The disease has been attributed to a specific organism—the bacillus parotidis—but whether this is indeed the exciting cause is as yet uncertain. Parotitis occurs in epidemics, usually during the colder seasons of the year; sporadic cases are also seen. As it is extremely infectious, and yet unattended by any very serious inconvenience, it spreads rapidly by the agency of schools. The susceptibility of young infants and aged persons is slight, but with these exceptions, mumps may occur at any period of life, though it is most common up to the tenth or twelfth year.

After a long **incubation**, from a fortnight to three weeks, commonly about twenty days, the first **symptoms** develop. There is slight feverishness, loss of appetite, and general discomfort; and, after these have lasted for a day or two, swelling of the face is noticed. Very often, however, the initial symptoms are so little marked that the parotitis is the first symptom of the disease. The swelling is seen in front of, and below, the lobe of one ear; as it increases in size the ear is pressed outwards, and the side of the face and neck become swollen and œdematous. In the course of a day or two the opposite parotid becomes similarly inflamed. When the disease is at its height there is often some difficulty in opening the mouth, and pain, radiating in the direction of the ear, on swallowing and chewing. The increase in size of the face gives the patient a characteristic appearance; the skin over the swelling is tense, but not reddened, the outline of the parotid can be distinctly traced, and the gland has a doughy feeling, but is only slightly tender. The throat is hyperæmic, and the tonsils somewhat congested; the saliva may be altered in amount, but remains qualitatively unchanged. The head is held steady and looks straight forwards, or, if only one gland be inflamed, is turned to the side. The submaxillary and sublingual glands often participate in the inflammation, or they alone may suffer, the parotid being spared. To this condition the name of **submaxillary mumps** has been given.

The temperature is raised, but to no great extent. The fever persists for about four days, and then abates. The glandular enlargement subsides more slowly.

Mild as the disease is, the number of serious **complications and sequelæ** attributed to it is striking. They are fortunately but seldom met with. Orchitis is not common before puberty; grave nervous symptoms have been known to accompany it. Meningitis may result from spread of the inflammation to the brain; deafness from its spread to the ear; cardiac complications, ocular complications, arthritis, nephritis, and paralyses have been described; all these must surely be rare. Suppuration is seldom observed, and the persistence of the condition as a chronic parotitis is extremely unusual.

Mumps is most infectious just before the parotid swelling develops. Within a few days after the disease has declared itself the risk to other persons is slight. **Convalescence**, however, is not complete until all swelling has subsided. **Relapses** may occur, and, although the **protection** is in general good, so also may second attacks. The period of **quarantine** is three weeks.

The **prognosis** is favourable.

The **diagnosis** offers few difficulties. In infants, a swelling just in front of the ear is sometimes to be observed; in the majority of cases this is due to abscess formation superficial to the parotid. In older children we have to decide whether or not a parotitis is specific (mumps) or metastatic. The latter, which frequently goes on to suppuration, is a not uncommon complication of many acute diseases, and, in particular, of abdominal affections. The history of the case, the absence of suppuration, and the bilateral character of the swelling, serve to differentiate mumps from all other forms of parotitis.

The **treatment** consists in confinement to the house, or to bed; in wrapping the face in wadding; and in the use of a fluid diet.

EPIDEMIC CEREBRO-SPINAL MENINGITIS.

Pathogenesis.—The infective agent is, in most cases, an organism morphologically identical with the diplococcus of Frænkel. It appears to gain entrance by the nose through the ethmoidal and frontal sinuses, or through the ear—the diplococcus being among the organisms to which purulent otitis media may be due. The disease occurs in epidemics and, occasionally, sporadically; it appears to remain endemic in certain localities. Children and young persons are most liable to it, and no immunity is conferred by an attack. The majority of cases occur in winter and spring. In this country the disease is almost unknown; epidemics have occurred in Dublin and in various parts of England, whilst Scotland appears to have remained free from these outbreaks.

The anatomical changes consist of a purulent leptomeningitis of the brain and cord; small foci of encephalitis and hæmorrhage may be seen, but large abscesses are rare.

Symptoms.—After an incubation period of about five days, the diseases sets in acutely with fever, occasionally a rigor, severe headache, stiffness and pain about the neck, and torpor or delirium. In some cases the symptoms are so violent as to prove rapidly fatal, in others (abortive forms), they pass off quickly; but, in an average case, the duration of the disease is from three to four weeks. The symptoms may be grouped under two heads:—Those due to meningitis, and those due to the general poisoning. 1. **Nervous Symptoms.**—Headache is severe, there is giddiness, and very often delirium or coma. Pain in the back, opisthotonos, and tenderness along the vertebral column are also common. Convulsions occur only in bad cases; the vomiting is in some degree a sign of the general nervous disturbance. The local nervous symptoms are those of meningitis, and correspond in a greater or less degree with those met with in the tubercular and septic forms of the disease. They exhibit certain peculiarities, and their chief manifestations are here briefly described. The sensory nerves are very markedly involved. Dulness of hearing is common, and may be due to a lesion of the auditory nerve or to a purulent otitis. Visual disturbances are less distinct; still, optic neuritis is common, and other inflammations about the eye have been observed. The remaining ocular nerves are also very frequently involved, and strabismus, nystagmus, pupillary changes, ptosis, &c., are often noticed. The seventh nerve, too, may suffer, and paralysis or spasm of one side of the face be produced. Owing to the inflammation being chiefly limited to the posterior aspect of the cord, the spinal nerves are less severely affected. One of the most constant symptoms is hyperæsthesia of the skin of the extremities; rigidity of the limbs, twitching of the muscles, and abnormality of the reflexes may also occur. Hemiplegia and paraplegia are somewhat rare phenomena. We must, no doubt, in part at least, ascribe to the irritation of the various spinal and cranial nerves the cutaneous eruptions to be described in the ensuing paragraph.

2. **General Symptoms.**—The most characteristic of these are the rashes met with in about 50 per cent. of all cases. Labial herpes, or herpes of the trunk or extremities, is very common; urticaria, purpura, and roseola have also been noted. These rashes are distinguished by symmetry—herpes may, for instance, appear upon both wrists, or on both sides of the face. The course of the fever is very variable, and in no way pathognomonic. It bears no proportion to the severity of the nervous symptoms, and may be quite absent or of an extremely remittent character. In fatal cases a pro-agonic rise of temperature is common. The pulse is rapid, seldom slowed, but may vary greatly from time to time. The symptoms referable to the digestive system are those common to all febrile disorders; jaundice also is sometimes present. The spleen may be slightly enlarged; there is fairly well-marked leucocytosis. Urinary symptoms are inconstant; retention or incontinence may occur, and glycosuria and polyuria have been noted. As might be expected in a disease where the nerves at the base of the brain are liable to become involved, an aspiration bronchitis or pneumonia is a common occurrence. A curious and not very rare symptom is swelling of the joints of the limbs. The results of the disease are often serious: deafness—leading in young children to deaf-mutism, blindness, chronic hydrocephalus, and various paralyses are among the most important.

The **diagnosis** of the disease is greatly assisted by its epidemic occurrence and, in sporadic cases, may be impossible. The acute onset, the extreme rigidity of the neck, the retraction of the head, the tenderness along the spine, the skin eruptions, the early affection of the sensory nerves, the absence of a local source from which sepsis might arise, and the absence of evidence of tubercle, are all points on which a diagnosis might rest.

The **prognosis** is grave and depends upon the severity of the nervous symptoms. About 40 per cent. of all cases die; in children under one year old the disease is usually fatal.

The **treatment** is that of meningitis in general.

GLANDULAR FEVER.

To the acute specific diseases of infancy must now be added a condition characterised by ephemeral fever of benign and transient course, followed by a somewhat more persistent enlargement of the cervical glands. Since its description by Pfeiffer, in 1889, numerous cases have been recorded; it appears to be more common than is generally supposed, and may possibly account for some of the cases of cervical glandular enlargement in infancy for which no definite cause can be discovered.

Pathogenesis.—The disease is relatively frequent in infancy, especially between the sixth and thirtieth months—*i.e.*, at the period of the first dentition. It also occurs during the second dentition, and possibly, too, in the adult. Its production appears to be favoured by chill, and perhaps by gastro-enteritis and debilitating diseases. The infection is supposed to enter by the buccal mucous membrane, to spread by the lymphatics, and to be checked by the first glands which it reaches. The organism is believed to be a streptococcus, but the nature of the disease is still uncertain; it has been regarded as a form of **pestis minor.**

Symptoms.—The onset is sudden; a rapid rise of temperature to 102° or 104° Fahr., vomiting, anorexia, and prostration, usher in the disease. The temperature remains up for from forty-eight to sixty hours or longer, and shows morning remissions. Further examination reveals nothing to account for the temperature beyond the merest trace of angina and a little difficulty in swallowing. In two or three days, however, a swelling is noticed at one or other angle of the lower jaw; on more minute examination, it is seen to consist of one or two tumefied glands, and may attain the size of a pigeon's egg. Beyond slight difficulty in moving the head, the patient suffers little inconvenience. The temperature falls gradually, and apyrexia is soon complete, but the adenitis persists for a fortnight, or, in the case of large glands, for a month or two. Suppuration is very rare; the adenitis is limited to the glands of the one side, and seldom extends to those along the sterno-mastoid, or in the axillæ. Enlargement of the deeper glands of the body has not been demonstrated. Symmetrical adenitis is rare. Complications are uncommon; like all infectious diseases, glandular fever may lead to nephritis; repeated epistaxis has been observed.

The **diagnosis** is impossible until the glandular enlargement develops, and then other general and local causes of adenitis must be excluded.

The **prognosis** is absolutely favourable, and the **treatment** symptomatic. The child should be isolated until a cure is complete.

INDEX.

ABDOMEN, Anatomy of, 6; Examination of, 97.
Abdominal tuberculosis, 223.
,, tumours, 98.
Abscess, Perinephric, 299; Retropharyngeal, 93, 262; Subcutaneous, 85; Tonsillar, 90.
Achondroplasia, 174, 187, 188.
Acne, 83.
Acute rickets, 174.
Adenoids, 261; Diagnosis of, 61, 90; Facies of, 63.
Adherent pericardium, 106, 252.
Albuminuria, 120; in newly-born, 18.
Alimentary system, Diseases of, 191; Examination of, 85.
Alopecia, 84.
Amaurotic family idiocy, 333.
Anæmia, Pernicious, 239; Pseudoleukæmic, 240; Simple, 237; Splenic, 240.
Anamnesis, 54.
Anatomy, 1.
Antipyretics, 47.
Antiscorbutic element in food, 24.
Antitoxin, Diphtheria, 356.
Anuria, Temporary, 118.
Anus, Examination of, 102; Fissure of, 221; Imperforate, 222; Prolapse of, 220.
Aorta, relation to pulmonary artery, 11.
Aortic disease, 251.
Apex-beat, Position of, 106.
Aphasia, 342.
Aphthæ, Bednâr's, 89.
Appetite, 93.
Arteries, Hypoplasia of, 254.
Arthritis, 133; Chronic rheumatic, 185; Rheumatoid, 184.
Ascarides, 231.
Ascites, Causes of, 99, 230.
Asphyxia neonatorum, 137.
Asthma, 283.
Atelectasis, Acquired, 278; Congenital, 139.
Athetosis, 328, 330.
Athrepsia, 157.
Atrophy, Progressive muscular, 346; Simple, 157.
Auscultation, 108, 116.

BACILLUS coli communis, 16.
,, of diphtheria, 91.
,, lactis aërogenes, 16.
Bacteria of intestinal tract, 16.
Barley water, 33.
Barlow's disease, 176.
Baths, Therapeutic use of, 41.
Bednâr's aphthæ, 89.
Belladonna rash, 75, 79.
Biedert's cream mixture, 34.
Bile, 16.
Bile ducts, Congenital obliteration of, 234.
Birth palsies, Cerebral, 155; Peripheral, 348.
Bladder, Anatomy of, 6; Examination of, 120.
Blepharospasm, 311.
Blisters, 44.
Blood, Characters of, 12, 235; Diseases of, 235; Examination of, 104.
Bones, Diseases of, 134.
Bottles, Feeding, 32.
Brachial plexus paralysis, 348.
Brain, Anatomy of, 7; Circulation in, 123; Growth of, 7, 19; Tumours of, 340; Vascular disturbances in, 334.
Bright's disease, 292; Cirrhotic, 295; Facies of, 62.

Bromide cruption, 83.
Bronchial glands, Enlarged, 279; Eustace Smith's sign of, 110.
Bronchitis, 265; Capillary, 267.
Broncho-pneumonia, 273; Tubercular, 281.
Buhl's disease, 156.

CALCULUS, *see* Stone.
Cancrum oris, 87, 195.
Carbohydrates, 24; in human milk, 25.
Cardiac apex, Position of, 5, 106.
Carpo-pedal spasm, 62, 306.
Case-taking card, 53.
Catarrhal pneumonia, 273.
Cathcart's sterilizer, 35.
Cephalhæmatoma, 140.
Cerebral anæmia, 336.
  ,, hæmorrhage in newly-born, 155.
  ,, hyperæmia, 335.
  ,, irritation, Position in, 61.
  ,, paralysis, Birth, 155; Infantile, 326.
  ,, tumour, 340.
Cerebro-fluid, Diagnostic value of, 129.
Cerebro-spinal meningitis, Epidemic, 379.
Chest, *see* Thorax.
Cheyne-Stokes' respiration, 115; Fontanelle movements in, 125.
Chicken-pox, 372; Rash of, 77.
Chilblain, 79.
Chlorosis, 238.
Cholera infantum, 203.
Chorea, 307; Congenital, 330; Facies of, 63; Habit, 311; Post-hemiplegic, 328.
Chvostek's symptom, 172.
Cicatrices, 74.
Circulation, in brain, 123; in fœtus, 10.
Circulatory system, Diseases of, 245; Examination of, 105.
Cirrhosis of kidney, 295; of liver, 233; of lung, 277.
Clubbing of fingers, 68.
Colic, Signs of, 61.
Colon, Idiopathic dilatation of, 220.
Colostrum, 26.
Condensed milk, 37.
Consolidation of lung, Signs of, 117.
Constipation, 96, 218.
Consumption, *see* Phthisis, Tuberculosis.
Contractures, 132.
Convulsions, 132, 300.
Copaiba rash, 76.
Cord, Anatomy of, 7.
Coryza, *see* Rhinitis.
Cough, Diagnosis of, 113.
Counter-irritants, 44.
Cow's milk, 31.
Craniotabes, 123, 169.
Cranium, Abnormalities of, 122; Percussion of, 123, 341.
Cretinism, 185.
Croup, *see* Laryngitis.
"Croup," [Pseudo], 263.
Croupous pneumonia, 270.
Cry, Hydrocephalic, 64.
Crying, 63.
Cyanosis, 71; in congenital heart disease, 257.
Cystic kidney, Congenital, 299.

DEAF-MUTISM, 342.
Death from enlarged thymus, 244.
Defæcation, 95.
Deformities, 67.
Dentition, 14, 196; Delayed, 14.
Desquamation in scarlet fever, 76.
Diaceturia, 121.
Diagnosis, 51.
Diarrhœa, 96; Catarrhal, 206; Choleraic, 203; Dysenteric, 204.
Diarrhœal diseases, 197.
Diet in childhood, 39; in infancy, 23; in sickness, 40.
Digestion, 15; Disorders of, 93, 197.
Diphtheria, 351; Diagnosis of, 91; Rashes in, 75.
Diplegia, 330.
Dosage, 46, 49.
Dropsy, *see* Ascites, Œdema.
Drugs, Administration of, 46; influencing milk secretion, 27; Rashes due to, 79.
Ductus arteriosus, Closure of, 11; Diagnosis of patent, 110; Patent, 257.
Ductus venosus, Closure of, 11.

Dysenteric diarrhœa, 204; Chronic, 206.
Dyspepsia, Acute, 201; Chronic, 205, 206.
Dyspnœa, Causes of, 112, 263.
Dystrophy, Muscular, 346.
Dysuria, 61, 118.

Ear, Anatomy of, 2; Examination, of, 131.
Eclampsia, 132, 300.
Eczema, 83; Treatment of, 47.
Egg-albumin mixture, 39.
Electricity, Therapeutic value of, 42.
Emotions, Development of, 21.
Emphysema, Pulmonary, 277; Subcutaneous, 73.
Empyema, 289; Cough in, 113.
Encephalocele, 339.
Endocarditis, Acute, 245; Malignant, 250; Rheumatic, 181.
Enemata, 43.
Enteric fever, 359; Eruption of, 77.
Enteritis, Acute, 202; Chronic, 206; Follicular, 206.
Enuresis, 17; Diagnosis of, 119; Nocturnal, 315.
Eosinophile leucocytes, 13, 235.
Epidemic cerebro-spinal meningitis, 379.
Epilepsy, 303; Facies in, 62.
Epiphyses, Affections of, 134.
Epistaxis, 111.
Epithelial pearls on palate, 3, 89.
Eruptions, 74; Antipyrin, 76; Bromide, 83; Congenital syphilis, 78, 79, 82; Copaiba, 76; Drug, 79; Erysipelas, 77; Erythematous, 75; of exanthemata, 75; Hæmorrhagic, 80; Macular, 75; Papular, 79; Pustular, 83; Rheumatic, 78, 181; Scaly, 80; Typhoid, 77; Vesicular, 82.
Erysipelas neonatorum, 148.
Erythema, 74; multiforme, 78; nodosum, 78, 181; Rheumatic, 181; Septic, 75.
Erythroblasts, 12, 235.
Erythrocytes, 12; Varieties of, 235.
Eustachian tube, Anatomy of, 2.
Examination of patients, 51.
Exfoliative dermatitis, 82.
Exophthalmic goitre, Facies of, 63.
Exophthalmos, 130.
Exploratory puncture of pleura, 118, 288.
Eye, Lesions of, 130; Ophthalmoscopic examination of, 131.

Face, Anatomy of, 3.
Facial paralysis, 350.
,, spasm, 311.
Facies, 62.
Fæces, 16; Action of drugs on, 97; Examination of, 96.
Family cord affections, 332.
Fats, *see* Hydrocarbons.
Fatty degeneration of newly-born, 156.
,, liver, 233.
Favus, 81; Treatment of, 48.
Feebleness, Congenital, 136.
Feeding (*see* Diet), Artificial, 30; Forced, 40.
,, bottles, 32.
Fits, 132, 300.
Fœtal circulation, 10.
,, rickets, 173.
Food (*see* Diet), Elements of, 23.
Fontanelles, Date of closure of, 2; Growth of, 10; Movements of, 123.
Foramen ovale, Closure of, 11; Patent, 257.
Fragilitas ossium, 188.
Frenum linguæ, Shortness of, 65; Ulcer on, 89.
Friedreich's Disease, Gait in, 66.

Gait, Abnormal, 65.
Gall-stones, 235.
Gases, of stomach and intestines, 16; Respiratory interchange of, 13.
Gastric catarrh, Acute, 201; Chronic, 206.
,, digestion, 15.
,, spasm, Congenital, 215.
Gastro-intestinal catarrh, 197; Acute, 198; Chronic, 205; Treatment of, 209.
Geographical tongue, 89.
German measles, 371; Eruption of, 76.
Glands, Examination of, 103.
Glandular fever, 380.
Glottis, Œdema of, 265.

Glycosuria, 121.
Gonorrhœal affections of newly-born, 146.
,, vaginitis, 299.
Gravel, 296.
Green stools, 97.
"Growing pains," 180.
Growth, Abnormal, 66; in height, 8; in weight, 9.
Gums, Ulceration of, 87.

HABIT spasm, 311.
Hæmatemesis, 95.
Hæmatoma of sterno-mastoid, 141.
Hæmaturia, 121.
Hæmic murmurs, 108.
Hæmoglobin, 12.
Hæmoglobinuria, 121; Epidemic, 156.
Hæmopoietic system, Diseases of, 235; Examination of, 103.
Hæmoptysis, 114.
Hæmorrhage, Cerebral, in newly-born, 155.
Hæmorrhagic diathesis of infancy, 150.
Hæmorrhagic eruptions, 80.
Harrison's sulcus, 114, 170.
Head (*see* Facies), Growth of, 10.
Headache, 317.
Hearing, Development of, 21; Examination of, 131.
Heart, Anatomy of, 5; Apex of, 106; Congenital affections of, 254; Development of, 254; Diseases of, 245; Examination of, 105; Functional affections of, 254; Growth of, 11; Syphilis of, 254; Valvular disease of, 250.
Hemianopsia, 329.
Hemiplegia, 327; Bilateral, 330; Choreic, 329.
Hernia, Umbilical, 154.
Herpes, 82; of lips, 85; of throat, 93.
History of case, 54.
Hodgkin's disease, 103.
Human milk, 24; Action of diet on, 26; Action of drugs on, 27; Clinical examination of, 27; Composition of, 25; Organisms in, 27; Quantity of, 26; Variations in, 26.
Humanised milk, 37.
Hutchinson's œdema, 73.
,, teeth, 88, 163.
Hydrencephalocele, 339.
Hydrencephaloid, 203, 336.
Hydrocarbons, 23; in human milk, 25.
Hydrocephalus, 336; Facies of, 63; Spurious, *see* Hydrencephaloid.
Hydrochloric acid in gastric juice, 15.
Hydronephrosis, 297.
Hypnotics, 47.
Hysteria, 312.

ICHTHYOSIS, 82.
Icterus, 72; Catarrhal, 232; Diagnosis of, 72; in obliteration of bile ducts, 72; in septicæmia, 72; neonatorum, 142; Syphilitic, 72.
Idiocy, Amaurotic family, 333; Microcephalic, 63, 122; Mongolian, 188.
Ileo-colitis, Acute, 204; Chronic, 206.
Impetigo contagiosa, 83.
Inanition fever, 154.
Incontinence of urine, *see* Enuresis.
Indicanuria, 121.
Indigestion, *see* Dyspepsia.
Infantile paralysis, Cerebral, 326; Spinal, 343.
Infants' foods, 38.
Infectious diseases, 351.
Insomnia, 314.
Integumentary system (*see* Skin), 18.
Intertrigo, 78; Treatment of, 48.
Interventricular septum, Patent, 256; Diagnosis of, 110.
Intestinal catarrh, *see* Gastro-intestinal catarrh, Enteritis.
Intestinal juice, 16.
Intestinal obstruction, 215.
Intestines, Anatomy of, 6; Malformations of, 222; Tubercular ulceration of, 224.
Intussusception, 216.
Iodide rash, 82.
Irrigation of bowel, 43.

JADELOT'S lines, 62.
Jaundice, *see* Icterus.
Joints, *see* Arthritis.

KERION, 83.
Kidney (*see* Urinary system), Anatomy of, 6; Cirrhosis of, 295; Cysts of, 299; Diseases of, 292; Examination of, 119.
Klebs-Löffler bacillus, 91.

LACHRYMAL glands, 19.
Lactation, *see* Nursing.
Lactic acid in gastric juice, 15.
Lactose, *see* Carbohydrates.
Language, Development of, 21.
Lanugo, 18.
Laryngeal stridor, Congenital, 305.
Laryngismus stridulus, 172, 303.
Laryngitis, Acute, 263; Fibrinous, 265.
Larynx, Anatomy of, 4; Diseases of, 263.
Lavage of stomach, 43.
Leeching, 45.
Leucocytes, Varieties of, 12, 235.
Leucocythæmia, 239.
Lichen, 79.
Limping, 65.
Lithiasis, 296.
Little's disease, 330.
Liver, Anatomy of, 6; Cirrhosis of, 233; Examination of, 101; Fatty, 233.
Locomotory system, Examination of, 133.
Lumbar puncture, 129.
Lungs, Anatomy of, 5; Cirrhosis of, 277; Collapse of, 139, 278; Diseases of, 268; Examination of, 114; Inflammation of, 268; Inflation of, after birth, 13; Tuberculosis of, 280.
Lupus, 84.
Luschka's tonsil, 4.
Lymphadenoma, 103.
Lymphatic glands of neck, 4.
Lymphatic system, 12.

MAMMARY glands, 19; Inflammation of, 141.
Marasmus, 157.
Marrow-cells, 236.
Massage, 42.
Mastitis, 141.
Mastoid antrum, 3.
Maternal impressions, 54.
Measles, 367; Rash of, 76.
Meat-juice, Raw, 39.
Meckel's diverticulum, 98, 155.
Meigs's mixture, 34.
Melæna neonatorum, 152.
Membrane, False, in throat, 90.
Meningitis, Acute purulent, 323; Differential diagnosis of, 325; Epidemic cerebro-spinal, 379; Simple basal, 324; Syphilitic, 325; Tubercular, 319.
Meningocele, 339.
Metabolism, 8.
Microcephaly, 67, 122.
Micturition (*see* Dysuria), 17.
Migraine, 316.
Milk (*see* Human milk), Condensed, 37; Cow's, 31; Humanised, 37; Pasteurised, 34; Peptonised, 36; Sterilised, 34.
Mineral salts in food, 24.
Mitral disease, 251.
Molluscum contagiosum, 84.
Mongol idiocy, 187, 188; Facies of, 63.
Morbus cœruleus, 257.
Motor functions, Examination of, 131.
Mucous disease, 207.
,, patches, 86.
Multiple sclerosis, 334.
Mumps, 377.
Muscles, Diseases of, 135.
Myelocytes, 236.
Myocarditis, 253.
Myopathy, 346.

NASAL septum, 4.
Naso-pharynx, 4.
Neck, Anatomy of, 4.
Nephritis, 292; in newly-born, 145.
Nerve fibres, medullation, 20.
Nervous system, Examination of, 122; Functional diseases of, 300; Organic diseases of, 319; Physiology of, 19.
Neuralgia, 318.
Newly-born, Diseases of, 136.
Nightmare, 313.
Night terrors, 313.
Nodding spasm, 310
Nodules, Rheumatic, 84, 181.
Noma, 87, 195.
Nose, bleeding, 111; Diseases of, 259; Septum of, 4.

Nursing, Maternal, 28; Wet-, 30.
Nutrition, 68.
Nystagmus, 130.

OBSTRUCTION of the bowels, 215.
Œdema, 73; Angioneurotic, 73; of face, causes, 73; glottidis, 265; Hutchinson's, 73; neonatorum, 73, 145; Persistent congenital, 73.
Œsophagus, Affections of, 93.
Omphalitis, 147.
Ophthalmia neonatorum, 146.
Opisthotonos, 61.
Opium, dosage, 50.
Organisms in human milk, 25.
Orthopnœa, 61.
Osteo-arthritis, 184.
Osteomyelitis, 149.
Oxyurides, 230.

PACKS, 41.
Palate, Epithelial pearls on, 3, 89; Gothic, 67, 89; Paralysis of, 89; Ulcers on, 89.
Palpation of chest, 116.
Pancreatic juice, 16.
Papular eruptions, 79.
Paralysis, Birth, 155, 348; Brachial plexus, 348; Cerebral, 155, 326; Facial, 350; Hereditary spastic, 332; Infantile spinal, 343; Peroneal, 350; Post-diphtheritic, 354; Post-rachitic pseudo-, 175; Pseudo-hypertrophic, 347; Spastic, 330; Syphilitic pseudo-, 161.
Paraplegia, 330.
Parotitis, 104; Specific, 377.
Parrot's nodes, 161.
Pasteurisation, 36.
Patent ductus arteriosus, 257; Diagnosis of, 110.
Patent foramen ovale, 257; Diagnosis of, 110.
Pavor nocturnus, 313.
Pediculosis, treatment, 48.
Peliosis rheumatica, 189.
Pelvis, Anatomy of, 2.
Pemphigus, 82; neonatorum, 153; Syphilitic, 154.
Peptonisation, 36.
Percussion of skull, 123.
Pericarditis, Acute, 245; Rheumatic, 181.
Pericardium, Adherent, 252; diagnosis, 106.
Perinephric abscess, 299.
Peritoneum, Tumours of, 230.
Peritonitis, Septic, 148; Simple, 229; Tubercular, 226.
Perlèche, 86.
Pernicious anæmia, 239.
Perspiration, Deficient, 73; Excessive, 72.
Pertussis, 374.
Pestis minor, 381.
Petechiæ, *see* Eruptions, Hæmorrhagic.
Pharyngeal bursa, 4.
,, tonsil, 4.
Pharyngitis, 260.
Phthisis, 280.
Physiology, 7.
Pica, 93.
Pigeon-breast, 114.
Pityriasis, rosea, 81; versicolor, 82.
Plantar arch, 2.
Pleura, Inflammations of, 284.
Pleural effusion, 117; Purulent, 289; Serous, 286.
Pleurisy, 285; Rheumatic, 182.
Pleuro-pneumonia, 285.
Pneumonia, Catarrhal, 273; Croupous, 270; Interstitial, 277; Pathology of, 268; Septic, in newly-born, 149; Tubercular broncho-, 281.
Poliomyelitis anterior acuta, 343.
Position in disease, 61, 67.
Posological table, 49.
Post-diphtheritic paralyses, 354; Gait in, 66.
Potassium chlorate, Rash from, 80.
,, iodide, Rash from, 80.
Poultices, 43.
Prematurity, 136.
Prepuce, Adhesion of, 7.
Proctitis, 222.
Progressive muscular atrophy, Juvenile (*Erb*), 347.
Prolapsus ani, 220.
Proptosis, 130.
Proteids, 23; in milk, 25, 31.
Prurigo, 79.
Pseudo-croup, 263.
,, hypertrophic paralysis, 347.
,, leukæmic anæmia, 240.

Pseudo-paralysis, Post-rachitic, 175; Syphilitic, 161.
Psoriasis, 82.
Pulmonary artery (*see* Aorta), Atresia of, 110, 256.
Pulse, 11; Examination of, 110; Variations in, 111.
Puncture, Exploratory, of pleura, 118, 288; Lumbar, 129.
Purgatives, 42.
Purpura, 188; Causes of, 80; Diagnosis of, 80.
Pustular eruptions, 83.
Pyæmia, *see* Pyogenic diseases.
Pyelitis, 299.
Pylorus, Congenital hypertrophy of, 215.
Pyogenic diseases of newly-born, 146.

RACHITIS, *see* Rickets.
Rash, *see* Eruption.
Rectal injections, 43.
,, polypus, 221.
Rectum, Anatomy of, 6; Examination of, 102; Prolapse of, 220.
Red blood-corpuscles, *see* Erythrocytes.
Reflexes, Examination of, 131.
Regurgitation of food, 65.
Renal calculus, 296.
,, tumours, 298.
Respiration, 13; rate and rhythm, 115.
Respiratory spasm, Infantile, 305.
,, stridor, 113.
,, system, Diseases of, 259; Examination of, 111; Physiology of, 13.
Retraction of head, 61.
Retropharyngeal abscess, 93, 262.
Rhagades, 86.
Rheumatic eruptions, 78, 181.
,, fever, 180
,, nodules, 84, 181.
Rheumatism, Acute, 180; Chronic, 185; Muscular, 180.
Rheumatoid arthritis, 184.
Rhinitis, Acute, 259; Chronic, 260.
Rickets, 165; Acute, 174; Facies of, 63; Fœtal, 173; Late, 174; Position in, 67; Spleen in, 243.
Ringworm, 81; Treatment of, 48.
Rolando, Fissure of, 7.
Rolling of head, 61.
Rötheln, 371; Rash of, 76.

SALIVARY glands, 104.
,, secretion, 15.
Salts in human milk, 25.
Scabies, 83; treatment, 48.
Scaly eruptions, 80.
Scarlet fever, 363; Desquamation in, 76; Diagnosis of, 75.
Scars, *see* Cicatrices.
Sclerema neonatorum, 84, 143.
Scleroderma, 84.
Sclerosis, Multiple, 334.
Scoliosis, 127.
Scorbutus, 176.
Scrofula, Facies of, 63.
Scurvy, *see* Scorbutus.
Sebaceous glands, 18.
Sensory functions, Examination of, 130.
Septicæmia, *see* Pyogenic diseases.
Sight, Affections of, 130; Development of, 20.
Skin, Examination of, 70; Gangrene of, 85, 373; Pallor, 70; Pigmentation, 72; Redness, 71.
Skin diseases, Treatment of, 47.
,, eruptions, Diagnosis of, 74.
Skull (*see* Facies), 2.
Sleep, 21; Diagnostic value of, 65; Disorders of, 65, 313.
Sleeplessness, 314.
Smell, Development of, 21.
Somnambulism, 313.
Soxhlet's steriliser, 35.
Spasmodic affections, Peripheral, 311.
Spasmus nutans, 310.
Spastic paralysis, 330; Hereditary, 332.
Speech defects, 129, 342.
Spina bifida, 340.
Spine, 1; Abnormalities of, 127.
Spleen, 6; Diseases of, 243; Examination of, 103.
Splenic anæmia, 240.
Sponging, 41.
Sputum, 114.
Starch poultices, 44.
Starches, *see* Carbohydrates.

Sterilisation, 34.
Stigmata of degeneration, 62, 67.
Stimulants, 47.
Stomach, 6; Dilatation of, 101, 213; Examination of, 100.
Stomatitis, 87; Aphthous, 192; Catarrhal, 191; Gangrenous, 195; Gonorrhœal, 196; Herpetic, 192; Mycotic, 194; Ulcerative, 193.
Stone, 296.
Stools, Abnormal, 34.
"Strawberry tongue," 88.
Stridor, Causes of, 263; Congenital laryngeal, 305; Diagnosis of, 113.
Strophulus, 79.
Subcutaneous nodules, 84.
Submaxillary mumps, 378.
Sucking, Diagnostic value of. 64; Mechanism of, 14.
Sucking pads, 3.
Sudamina, 82.
Sweat glands, 18.
Sweating, *see* Perspiration.
Sylvius, Fissure of, 7.
Syphilis, Acquired, 159; Congenital, 159; Eruption of, 78, 79, 82; Facies, 63; of heart, 254; hereditaria tarda, 160; of mouth, 86; Pemphigus in, 82, 154.

TABES mesenterica, 225.
Taches cérébrales, 71.
Tænia, 232.
Tape-worm, 232.
Taste, Development of, 21.
Teeth, Abnormalities of, 88.
Teething, *see* Dentition.
Temperature, 19; in disease, 69; Pro-agonal, 70.
Tents. Bronchitis, 45.
Tetanus, Muscular, 20; Facies of, 62; neonatorum, 149.
Tetany, 305; Contractures of, 62; in rickets, 172.
Therapeutics, 40; of skin diseases, 47.
Thorax, Abnormalities of, 114; Anatomy of, 5; Growth of, 10.
Threadworms, 230.
Thrills, Endo-cardial, 107.
Throat, Examination of, 86, 90.
Thrush. 87, 194.
Thymus, Anatomy of, 5; Asthma from enlarged, 283; Diseases of, 244; Examination of, 104; Sudden death from enlarged, 244.
Thyroid, Examination of, 104.
Tinea circinata, 79.
Tongue, Examination of, 88.
Tongue-tie, *see* Frenum linguæ.
Tonsillitis, Rash in, 75.
Tonsils, Affections of, 90; False membrane on, 91.
Touch, Sense of, 21.
Trachea, 4.
Tricuspid disease, 251.
Trismus neonatorum, 149.
Trophic functions, Examination of, 133.
Trousseau's symptom, 172.
Tuberculosis, Abdominal, 223; Acute miliary, 282; Cerebral, 340; Chronic, 281; Intestinal, 224; of lungs, 280; of mesenteric glands, 225.
Tubular breathing, 117.
Tumours, of abdomen, 98; of brain, 340; of kidney, 298; of umbilicus, 155.
Tylosis, 82.
Typhoid fever, 359.

UMBILICAL vessels, Inflammation of, 147.
Umbilicus, Hæmorrhage from, 153; Inflammation of, 147; Tumours of, 155.
Urethra, 6.
Uric acid in urine, 18.
Urinary system, Diseases of, 292; Examination of, 118; Physiology of, 17.
Urine, Amount of, 17; Characters of, 18; Examination of, 120; Incontinence of, 119, 315.
Urticaria, 78; papulosa, 79.

VACCINATION scar, 74.
Vaginitis, 299.
Varicella, 372; Rash of, 77.
Vernix caseosa, 18.
Vertebral column, *see* Spine.

Vesical calculus, *see* Stone.
Vesicular eruptions, 82.
Vision, *see* Sight.
Vomited matters, 95.
Vomiting, 94; Cyclic, 95.
Vulva, Affections of, 300.

WALKING, 20; Delay in, 65.
Wasting, 68.
Weaning, 29.
Weight (*see* Growth), at birth, 1.
Wet-nursing, 30.
Whey, 38.
White corpuscles, *see* Leucocytes.
Whooping-cough, 374; Diagnosis of, 113; Facies of, 62.
Winckel's disease, 156.
Wine whey, 38.
Worms, intestinal, 230.
Wry-neck, 141, 311.

Bell & Bain, Limited, Printers, Glasgow.

10